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INSTALLATION RESTORATION PROGRAM

PHASE I - RECORDS SEARCH

ELMENDORF AFB, ALASKA

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PREPARED FOR

UNITED STATES AIR FORCE
AFESC/DEV
Tyndall AFB, Florida
and
ALASKAN AIR COMMAND
Elmendorf AFB, Alaska

SEPTEMBER 1983

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September 1983

By

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This Report identifies the areas that require additional study to determine their potential for contamination of the local ground water aquifer. A total of 28 sites were studied and rated using the Hazard Assessment Rating Methodology which is discussed in the report. The resulting ranking identified 11 on-base sites for further study. These sites are identified on maps and in writing. Detailed recommendations are provided for future study of these sites in Phase II of the IRP Studies. 18 Tables and 29 Figures are included to aid in understanding the report.

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EXECUTIVE SUMMARY

The Department of Defense (DOD) has developed a program to identify and evaluate past hazardous material disposal sites on DOD propert to control the migration of hazardous contaminants, and to control h rds to health or welfare that may result from these past disposal a- tions. This program is called the Installation Restoration P am (IRP). The IRP has four phases consisting of Phase I, Initial A ment/Records Search; Phase II, Confirmation/Quantification; Phase III, Technology Base Development/Evaluation of Alternative Remedial Actions; and Phase IV, Operations/Remedial Actions. Engineering-Science (ES) was retained by the Air Force Engineering and Services Center to conduct the Phase I, Initial Assessment/Records Search at Elmendorf AFB under Contract No. F08637-83-G0009, Call No. 5003, using funding provided by the Alaskan Air Command.

INSTALLATION DESCRIPTION

Elmendorf Air Force Base is located within the municipality of Anchorage in South-Central Alaska. The base is bounded by the City of Anchorage to its south, Fort Richardson Army Installation to the north and east, and Knik Arm in the west. The base is also located in close proximity to the Chugach State Park. Elmendorf AFB encompasses approximately 13,100 acres.

The initial construction of the base began in the summer of 1940. At that time the base was a part of the U.S. Army's Fort Richardson Installation. In 1951, the Army moved its operations to areas north and east of the base, and the Air Force assumed jurisdiction over what is now Elmendorf AFB.

Elmendorf AFB played an active role as a main air logistics center and staging area during World War II. Its role shifted to one of air defense of North America following the war up until the early 1960's. During the 1960's, Elmendorf AFB began providing support to other Air Force commands, particularly the Military Airlift Command (MAC). By the

1970's Elmendorf AFB increased its mission to include a fighter squadron which is currently active at the base.

ENVIRONMENTAL SETTING

The environmental setting data reviewed for this investigation identified the following major points that are relevant to Elmendorf Air Force Base.

- o Installation mean annual precipitation is 15.5 inches. The total amount of water available for infiltration is estimated to be in the range of five to nine inches or about thirty to fifty percent of the mean annual precipitation.
- o Flooding is not normally a problem on Elmendorf Air Force Base.
- o Installation surface soils are typically granular glacial deposits exhibiting moderate to high permeabilities.
- o The shallow aquifer system is present at or near ground surface at the installation and is intimately related to the local surface waters (Ship Creek at the base). The depth to the water table varies from five to fifty feet below land surface.
- o The regional aquifer (artesian system) is present at depths of approximately one hundred feet below installation land surface. The artesian system is separated from the shallow aquifer system by substantial thicknesses of confining materials (identified as the Bootlegger Cove Clay in some reports). The actual confining layer(s) may be several separate strata.
- o The shallow aquifer has been contaminated at the municipal landfill and at other locations in the City of Anchorage.
- o No evidence of ground-water contamination was reported for Elmendorf AFB disposal facilities.
- o The surface waters entering and exiting the base are considered to be of good quality.
- o No threatened or endangered species have been observed within installation boundaries.

From these major points, it may be seen that there are potential pathways for the migration of hazardous waste-related contamination to the shallow aquifer. If hazardous materials are present at ground surface, they may be transported a short vertical distance to a local shallow aquifer. Contaminants entering south installation shallow aquifers will most likely be discharged in base flow to Ship Creek,or Cherry Hill Ditch. Water entering north installation shallow aquifers will probably be discharged to area wetlands or local surface waters. Contaminant migration to the deep aquifer system is considered to be remote.

METHODOLOGY

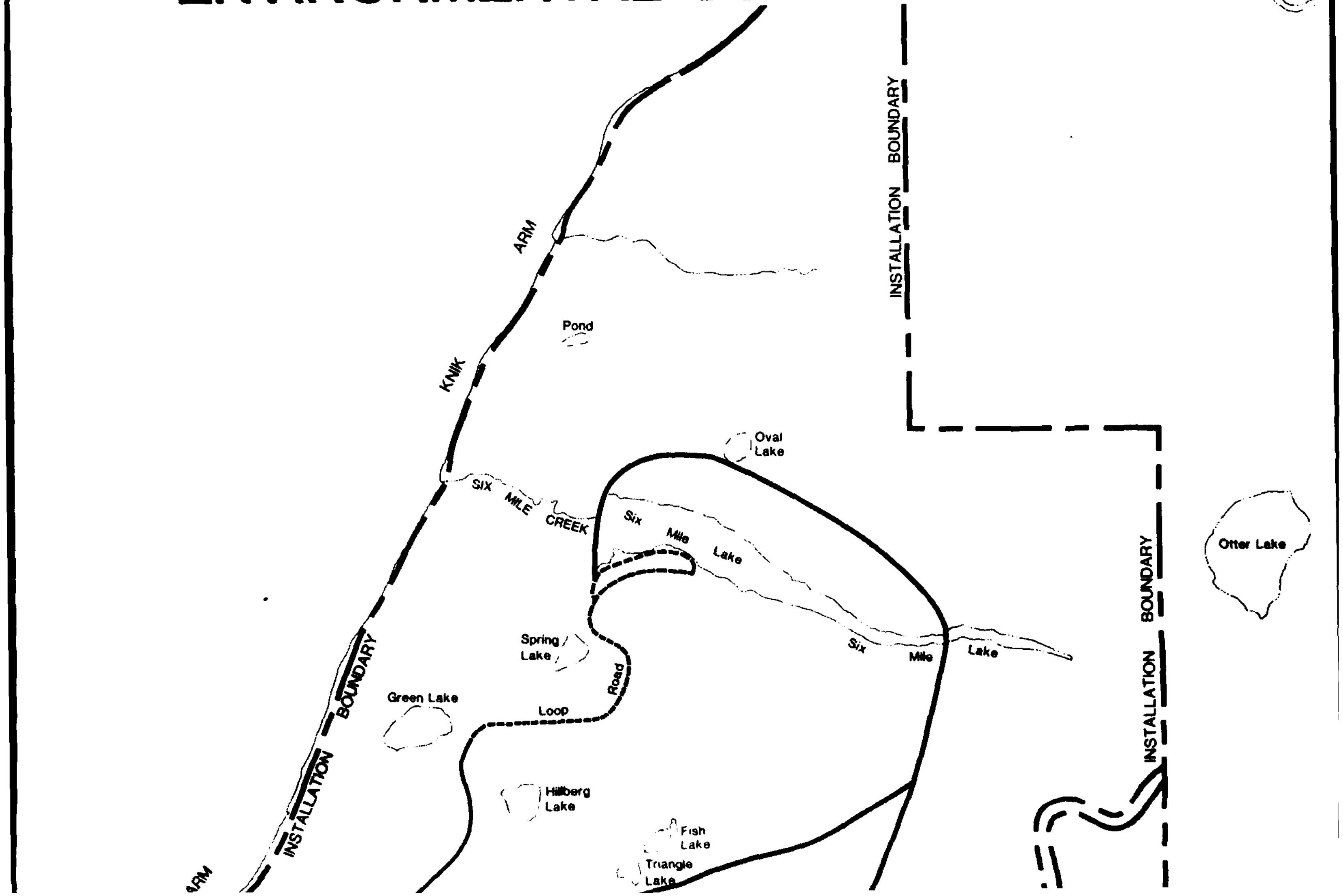
During the course of this project, interviews were conducted with base personnel (past and present) familiar with past waste disposal practices; file searches were performed for past hazardous waste activities; interviews were held with local, state and Federal agencies; and inspections were conducted at past hazardous waste activity sites. Twenty nine sites located on the Elmendorf AFB property were identified as potentially containing hazardous materials resulting from past activities (Figure 1). These sites have been assessed using a Hazard Assessment Rating Methodology (HARM) which takes into account factors such as site characteristics, waste characteristics, potential for contaminant migration and waste management practices. The details of the rating procedure are presented in Appendix H and the results of the assessment are given in Table 1. The rating system is designed to indicate the relative need for follow-on action.

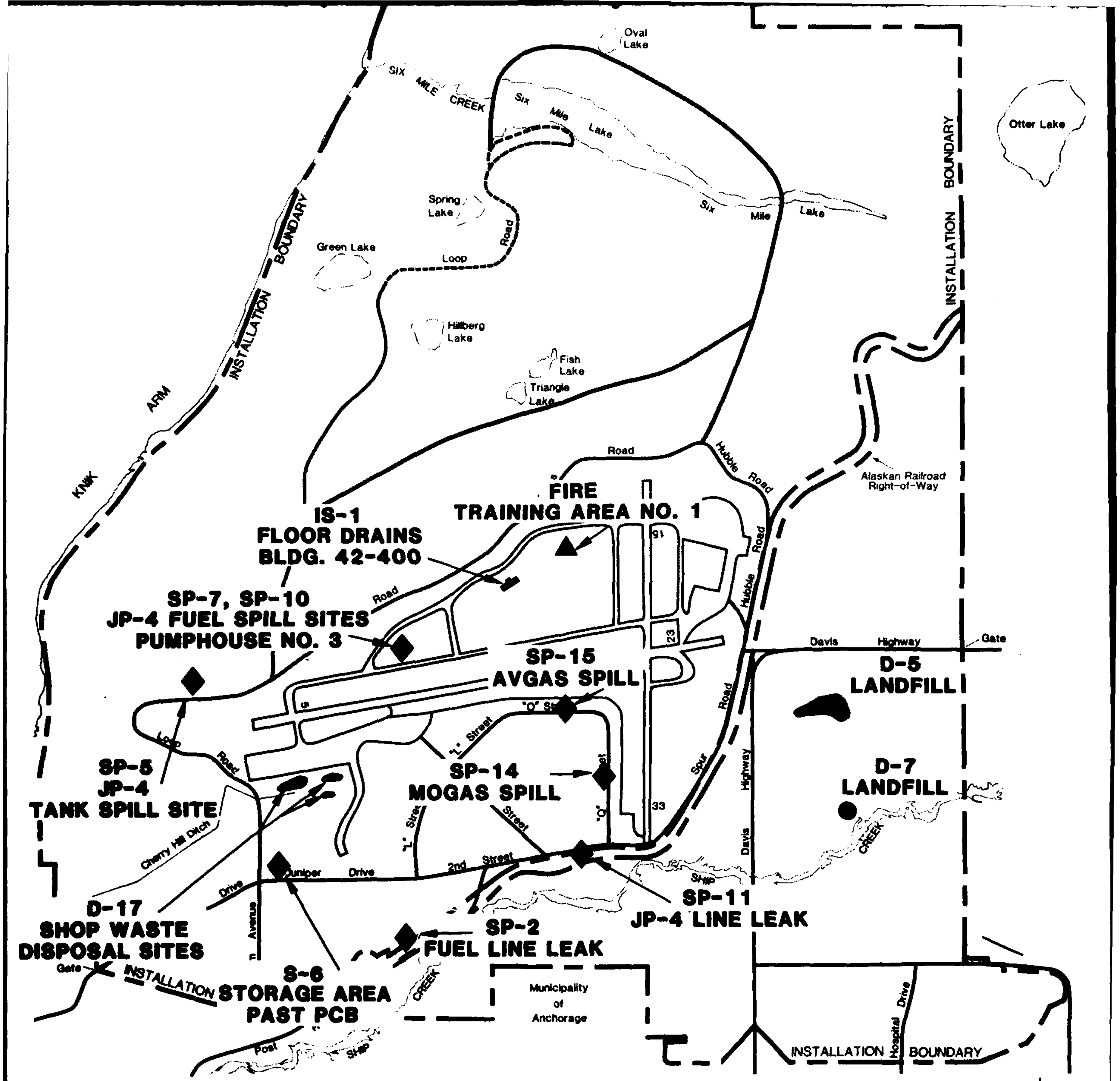
FINDINGS AND CONCLUSIONS

The following conclusions have been developed based on the results of the project team's field inspection, review of base records and files and interviews with installation personnel.

The areas determined to have a moderate potential for environmental contamination are as follows:

ELMENDORF AFB
SITES OF POTENTIAL ENVIRONMENTAL CONTAMINATION





FIRE TRAINING AREA NO. 1
IS-1 FLOOR DRAINS BLDG. 42-400
SP-7, SP-10 JP-4 FUEL SPILL SITES PUMPHOUSE NO. 3
SP-15 AVGAS SPILL
SP-14 MOGAS SPILL
SP-5 JP-4 TANK SPILL SITE
D-17 SHOP WASTE DISPOSAL SITES
S-6 STORAGE AREA PAST PCB
SP-2 FUEL LINE LEAK
SP-11 JP-4 LINE LEAK
D-5 LANDFILL
D-7 LANDFILL
INSTALLATION BOUNDARY
KNIK ARM
SIX MILE CREEK
Six Mile Lake
Oval Lake
Otter Lake
Spring Lake
Green Lake
Hillberg Lake
Fish Lake
Triangle Lake
Loop Road
Road
Hubble Road
Alaskan Railroad Right-of-Way
Davis Highway
Gate
Spur Road
"O" Street
"L" Street
2nd Street
Juniper Drive
Avenue
Cherry Hill Ditch
Ship Creek
Post
Municipality of Anchorage
Hospital Drive
15
23
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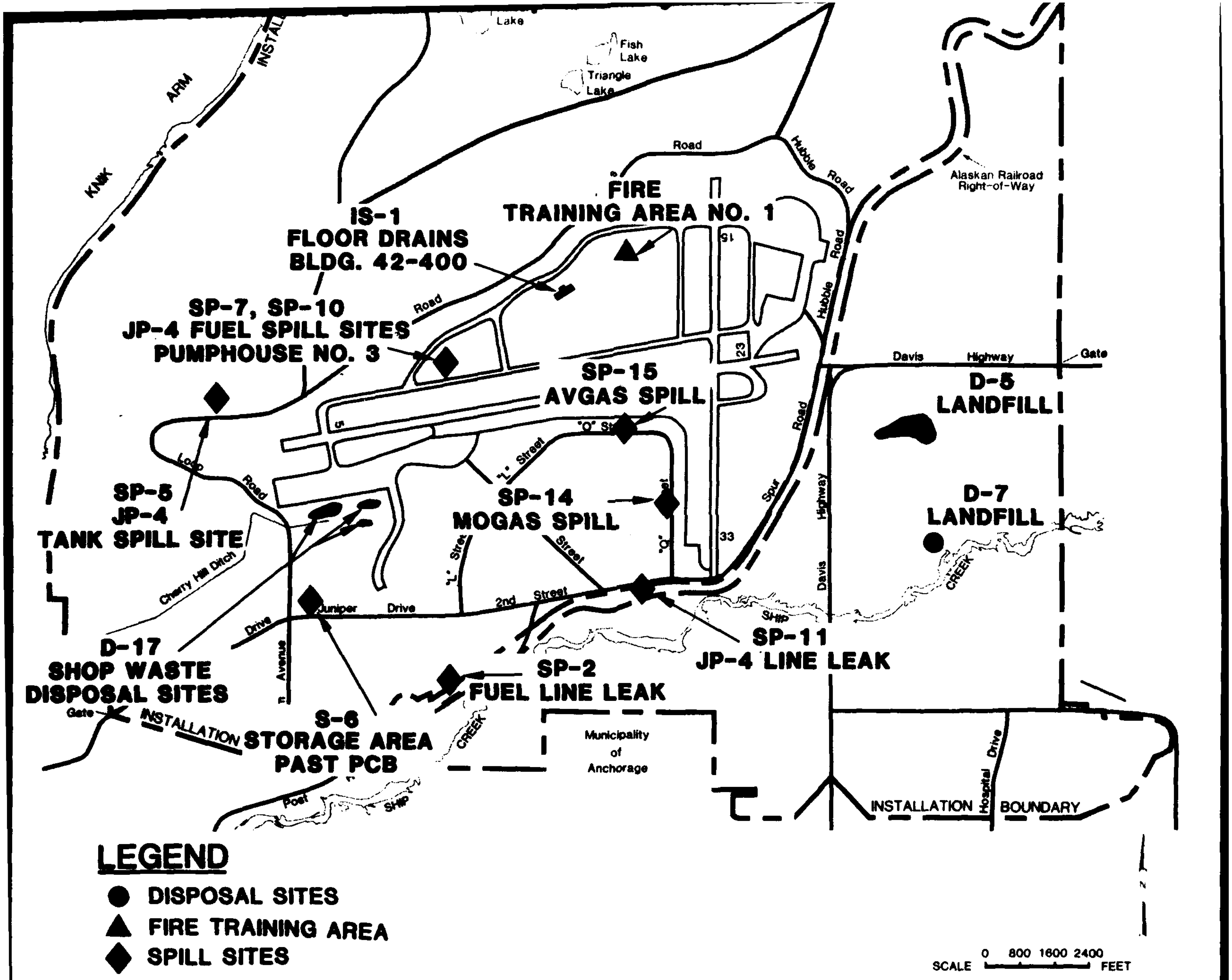


SOURCE: ELMENDORF AFB INSTALLATION DOCUMENTS

TABLE 1
PRIORITY RANKING OF POTENTIAL CONTAMINATION SOURCES

Rank	Site No.	Site Name	Date of Operation or Occurrence	Overall Total Score
1	SP-5	JP-4 Bulk Storage Tank Spill	Mid 1960's	66
2	D-5	Sanitary Landfill	1951-1973	64
3	SP-7	Pumphouse No. 3 JP-4 Spill	1980	63
4	SP-10	Pumphouse No. 3 JP-4 Spill	1964-1965	63
5	SP-11	JP-4 Line Leak	1978	62
6	FT-1	Fire Training Area	1940-1983	60
7	S-6	Old PCB Transformer Storage Area	1978	58
8	SP-2	JP-4 Line Leak	1964-1965	57
9	SP-14	Mogas Spill	1965	57
10	IS-1	Bldg. 42-400 Floor Drains	1950's-present	57
11	D-17	Shop Waste Disposal Site	1950's-1960's	56
12	SP-15	Avgas Spill	1961	56
13	D-15	POL Sludge Disposal Site No. 1	1964-1968	55
14	D-7	Sanitary Landfill	1965-1983	53
15	IS-7	Bldg. 21-900 Floor Drains	1950's-present	53
16	IS-8	Bldg. 32-060 Floor Drains	1950's-present	53
17	IS-2	Bldg. 42-425 Floor Drains	1950's-present	52
18	D-16	POL Sludge Disposal Site No. 2	1970-1983	51
19	IS-3	Bldg. 43-550 Floor Drains	1950's-present	49
20	IS-4	Bldg. 42-300 Floor Drains	1950's-present	49
21	IS-5	Bldg. 43-410 Floor Drains	1950's-present	49
22	SP-6	Diesel Fuel Spill	1976	47
23	IS-6	Bldg. 43-450 Floor Drains	1950's-present	47
24	SP-1	Diesel Fuel Line Leak	1956-1958	46
25	SP-4	Railroad Maint. Area Seepage	Late 1960's	46
26	D-13	Disposal Site	1967-1971	46
27	D-4	Disposal Site	-	46
28	SP-13	Diesel Fuel Line Leak	1968	42
29	D-3	Sanitary Landfill	1938-1941	39

- Site SP-5, Bulk Storage Tank Spill
- Site D-5, Sanitary Landfill
- Site SP-7, Site SP-10, Pumphouse No. 3, JP-4 Spill Sites
- Site SP-11, JP-4 Line Leak
- Site FT-1, Fire Training Area
- Site S-6, Old PCB Transformer Storage Area
- Site SP-2, JP-4 Line Leak
- Site SP-14, MOGAS Spill Area
- Site IS-1, Building 42-400 Floor Drains
- Site D-17, Shop Waste Disposal Site
- Site D-7, Sanitary Landfill

The areas determined to have a low potential for environmental contamination are as follows:

- Site SP-15, Avgas Spill
- Site D-15 POL Sludge Disposal Site No. 1
- Site D-16, POL Disposal Site NO. 2
- Site SP-6, Diesel Fuel Spill
- Site SP-1, Diesel Fuel Line Leak
- Site SP-4, Railroad Maintenance Area Oil Seepage
- Site D-13, Bluff Landfill
- Site D-4, Disposal Site
- Site SP-13, Diesel Fuel Line Leak
- Site D-3, Sanitary Landfill
- Site IS-7, Building 21-900 Floor Drains
- Site IS-8, Building 32-060 Floor Drains
- Site IS-2, Building 42-425 Floor Drains
- Site IS-3, Building 43-550 Floor Drains
- Site IS-4, Building 42-300 Floor Drains
- Site IS-5, Building 43-410 Floor Drains
- Site IS-6, Building 43-450 Floor Drains

RECOMMENDATIONS

The detailed recommendations developed for further assessment of potential environmental contamination are presented in Section 6. The recommended actions are one-time geophysical survey or sampling programs to determine if contamination does exist at the site. If contamination is identified, the sampling program may need to be expanded to further define the extent of contamination. The recommendations are summarized in Table 2.

TABLE 2

RECOMMENDED MONITORING PROGRAM FOR PHASE II

Elmendorf Air Force Base

Site	Rating Score	Recommended Monitoring	Remarks
1. SP-5 Bulk Storage Tank Spill	66	Conduct geophysical survey, using EMC and ER. If plume is present install wells and sample.	The survey should be used to locate placement of wells, if necessary.
2. D-5 Sanitary Landfill	64	Conduct geophysical survey using electromagnetic conductivity (EMC) and electrical resistivity (ER). If plume is present, install wells and sample.	The survey should be used to locate placement of wells, if necessary.
3. SP-7 & SP-10 and Pumphouse No. 3 Spill Sites	63	Conduct geophysical survey, using EMC and ER. If plume is present install wells and sample.	The survey should be used to locate placement of wells, if necessary.
4. SP-11 JP-4 Line Leak	62	Conduct geophysical survey, using EMC and ER. If plume is present install wells and sample. Obtain sediment samples from small stream and marsh west of site.	The survey should be used to locate placement of wells, if necessary.
5. S-6, PCB Transformer Storage Area	58	Conduct surficial soil sampling and analysis for PCB's at five locations (grid pattern) at former storage site.	If PCB's are detected, additional soil sampling will be required.
6. D-17 Shop Waste Disposal Site	56	Conduct geophysical survey, using EMC and ER. If plume is present, install wells and sample.	The survey should be used to locate placement of wells, if necessary.
7. D-7 Sanitary Landfill	62	Conduct geophysical survey, using EMC and ER. If plume is present install wells and sample. Grout existing wells penetrating the landfill.	The survey should be used to locate placement of wells, if necessary.
8. FT-1 Fire Training Area	57	Conduct geophysical survey, using EMC and ER. If plume is present install wells and sample.	The survey should be used to locate placement of wells, if necessary.
9. SP-2 JP-4 Line Leak	57	Conduct geophysical survey, using EMC and ER. If plume is present install wells and sample.	The survey should be used to locate placement of wells, if necessary.
10. SP-14 MOGAS Spill	57	Conduct geophysical survey, using EMC and ER. If plume is present install wells and sample.	The survey should be used to locate placement of wells, if necessary.
11. Site IS-1 Building 42-400 Floor Drains	57	Conduct geophysical survey, using EMC and ER. If plume is present install wells and sample.	The survey should be used to locate placement of wells, if necessary.
12. Ship Creek	-	Include more parameters (Table 6.2) for analyses in existing sampling program.	Will improve detection capability.
13. Site D-10 Asphalt Drum Storage Area	-	Sample 15-55 gallon drums containing unidentified liquid material to determine nature of wastes stored.	If wastes contained in drums are hazardous adjacent soil sampling may be required.

SECTION 1
INTRODUCTION

BACKGROUND

The United States Air Force, due to its primary mission, has long been engaged in a wide variety of operations dealing with toxic and hazardous materials. Federal, state, and local governments have developed strict regulations to require that disposers identify the locations and contents of disposal sites and take action to eliminate the hazards in an environmentally responsible manner. The primary Federal legislation governing disposal of hazardous waste is the Resource Conservation and Recovery Act (RCRA) of 1976, as amended. Under Section 6003 of the Act, Federal agencies are directed to assist the Environmental Protection Agency (EPA) and under Section 3012 state agencies to inventory past disposal sites and make the information available to the requesting agencies. To assure compliance with these hazardous waste regulations, DOD developed the Installation Restoration Program (IRP). The current DOD IRP policy is contained in Defense Environmental Quality Program Policy Memorandum (DEQPPM) 81-5, dated 11 December 1981 and implemented by Air Force message dated 21 January 1982. DEQPPM 81-5 reissued and amplified all previous directives and memoranda on the Installation Restoration Program. DOD policy is to identify and fully evaluate suspected problems associated with past hazardous contamination, and to control hazards to health and welfare that resulted from these past operations. The IRP will be the basis for response actions on Air Force installations under the provisions of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as clarified by Executive Order 12316.

PURPOSE AND SCOPE OF THE ASSESSMENT

The Installation Restoration Program has been developed as a four-phased program as follows:

Phase I - Initial Assessment/Records Search

Phase II - Confirmation/Quantification

Phase III - Technology Base Development/Evaluation of Alternative Remedial Actions

Phase IV - Operations/Remedial Actions

Engineering-Science (ES) was retained by the United States Air Force to conduct the Phase I Records Search at Elmendorf Air Force Base under Contract No. F08637-80-G0009, Call No. 5003. This report contains a summary and an evaluation of the information collected during Phase I of the IRP. The entire 13,174 acres under the jurisdiction of Elmendorf AFB was included in this study.

The goal of the first phase of the program was to identify the potential for environmental contamination from past waste disposal practices at Elmendorf AFB, and to assess the potential for contaminant migration. The activities that were performed in the Phase I study included the following:

- Reviewed site records
- Interviewed personnel familiar with past generation and disposal activities
- Inventoried wastes
- Determined estimated quantities and locations of current and past hazardous waste treatment, storage, and disposal
- Defined the environmental setting at the base
- Reviewed past disposal practices and methods
- Conducted field and aerial inspection
- Gathered pertinent information from Federal, state and local agencies
- Reviewed storage tank inventory
- Assessed potential for contaminant migration.

ES performed the on-site portion of the records search during May, 1983. The following core team of professionals were involved:

- J. R. Absalon, Hydrogeologist, BS Geology, 9 years of professional experience
- W. G. Christopher, Environmental Engineer and Project Manager, ME, 8 years of professional experience
- M. I. Spiegel, Environmental Scientist, BS Environmental Science, 6 years of professional experience.

More detailed information on these individuals is presented in Appendix A.

METHODOLOGY

The methodology utilized in the Elmendorf AFB Records Search began with a review of past and present industrial operations conducted at the base. Information was obtained from available records such as shop files and real property files, as well as interviews with past and present base employees from the various operating areas. Those interviewed included current and past personnel associated with the Civil Engineering Squadron, Bioenvironmental Engineering Services, Aircraft Generation Squadron, Equipment Maintenance Squadron, Field Maintenance Squadron and Fuels Management Branch. Experienced personnel from present and past tenant organizations were also interviewed. A listing of Air Force interviewees by position and approximate period of service is presented in Appendix B.

Concurrent with the base interviews, the applicable Federal, state and local agencies were contacted for pertinent base related environmental data. The ten agencies contacted and interviewed are listed below as well as in Appendix B.

- o U.S. Fish and Wildlife Service
- o U.S. Geological Survey - Water Resources Division
- o U.S. Environmental Protection Agency (USEPA)
- o U.S. Bureau of Land Management
- o U.S. Army Corps of Engineers - Alaska District
- o U.S. Army - Fort Richardson Installation
- o Alaska Division of Geological and Geophysical Surveys
- o Alaska Department of Environmental Conservation (ADEC)

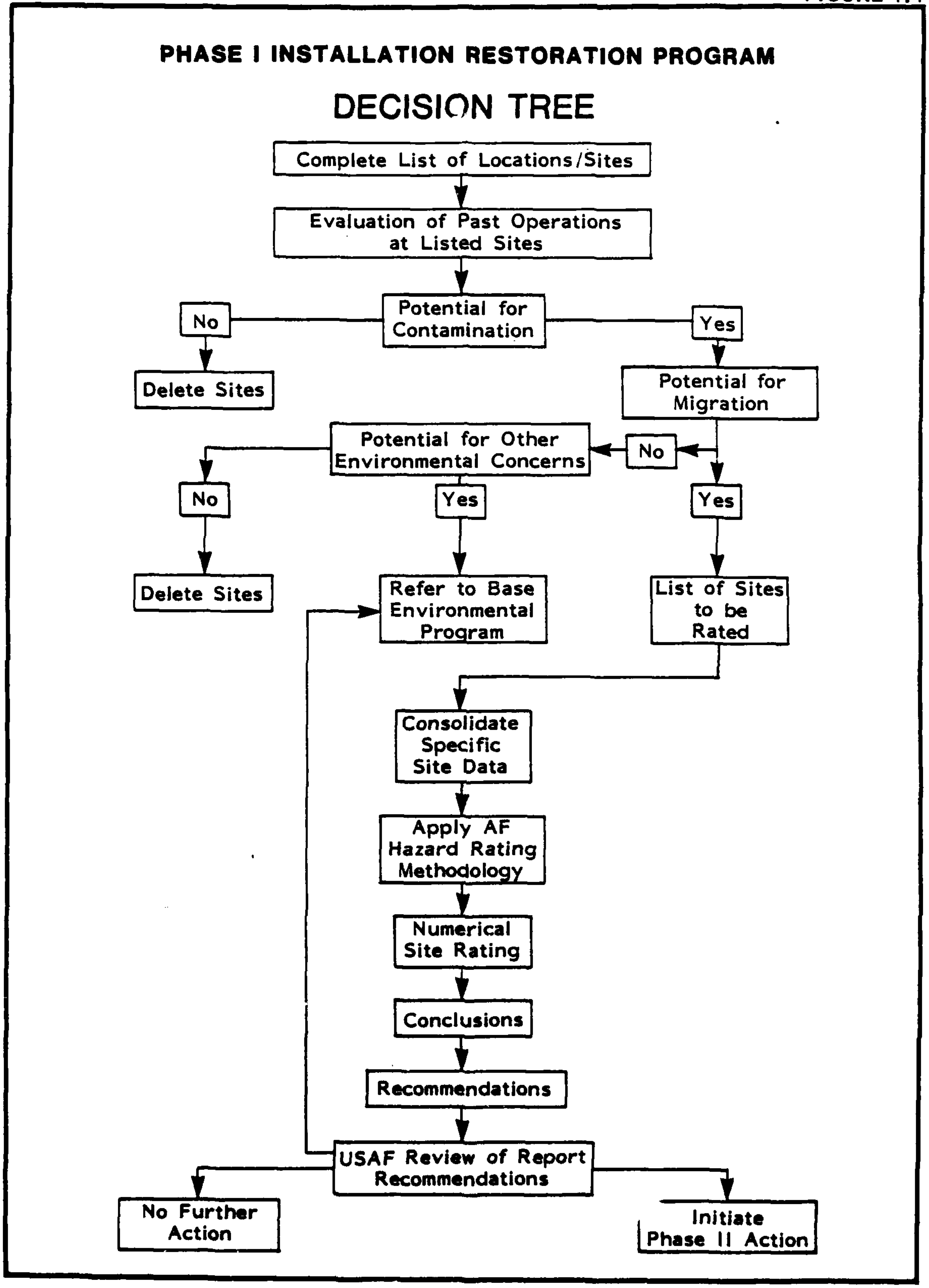
- University of Alaska - Arctic Environmental Information and Data Center
- Anchorage Water and Wastewater Utility

The next step in the activity review was to determine the past management practices regarding the use, storage, treatment, and disposal of hazardous materials from the various operations on the base. Included in this part of the activities review was the identification of all known past disposal sites and other possible sources of contamination such as spill areas.

A general ground tour and a helicopter overflight of the identified sites were then made by the ES Project Team to gather site-specific information including: (1) visual evidence of environmental stress; (2) the presence of nearby drainage ditches or surface water bodies; and (3) visual inspection of these water bodies for any obvious signs of contamination or leachate migration.

A decision was then made, based on all of the above information, whether a potential exists for hazardous material contamination at any of the identified sites using the Decision Tree shown in Figure 1.1. If no potential existed, the site was deleted from further consideration. For those sites where a potential for contamination was identified, a determination of the potential for migration of the contamination was made by considering site-specific conditions. If there were no further environmental concerns, then the site was deleted. If the potential for contaminant migration was considered significant, then the site was evaluated and prioritized using the Hazard Assessment Rating Methodology (HARM). A discussion of the HARM system is presented in Appendix G. The sites that were evaluated using the HARM procedures were also reviewed with regard to future land use restrictions.

FIGURE 1.1


PHASE I INSTALLATION RESTORATION PROGRAM
DECISION TREE
Complete List of Locations/Sites
Evaluation of Past Operations at Listed Sites
Potential for Contamination
No
Yes
Delete Sites
Potential for Migration
Potential for Other Environmental Concerns
No
No
Yes
Yes
Delete Sites
Refer to Base Environmental Program
List of Sites to be Rated
Consolidate Specific Site Data
Apply AF Hazard Rating Methodology
Numerical Site Rating
Conclusions
Recommendations
USAF Review of Report Recommendations
No Further Action
Initiate Phase II Action

SECTION 2

INSTALLATION DESCRIPTION

LOCATION, SIZE AND BOUNDARIES

Elmendorf Air Force Base is located within the municipality of Anchorage in South-Central Alaska (Figure 2.1 and 2.2). The base is bounded by the City of Anchorage to its south, Fort Richardson Army Installation to the north and east, and Knik Arm in the west. The base is also located in close proximity to the Chugach State Park. Elmendorf AFB encompasses approximately 13,100 acres. Figure 2.3 depicts the configuration of the base property.

INSTALLATION HISTORY

The initial construction of Elmendorf Air Force Base began in June, 1940. At that time the base was popularly known as Elmendorf Field. Elmendorf Field was formally designated as Fort Richardson in November, 1940, under the jurisdiction of the U.S. Army. In March, 1951, the Army moved its operations to the areas north and east of the base. At that time the Air Force assumed control of the original Fort Richardson facilities which were renamed Elmendorf Air Force Base.

The first Air Force unit to be assigned to Alaska, the 18th Pursuit Squadron, arrived in February, 1941. The 23rd Air Base Group was assigned shortly afterwards to provide base support.

Other Air Force units poured into Alaska as a Japanese threat developed into World War II. The 11th Air Force, the predecessor of Alaska Air Command (AAC), was formed at Elmendorf AFB in early 1942.

Elmendorf Field played a vital role as the main air logistics center and staging area during the Aleutian Campaign and later air operations against the Kurile Islands.

FIGURE 2.1

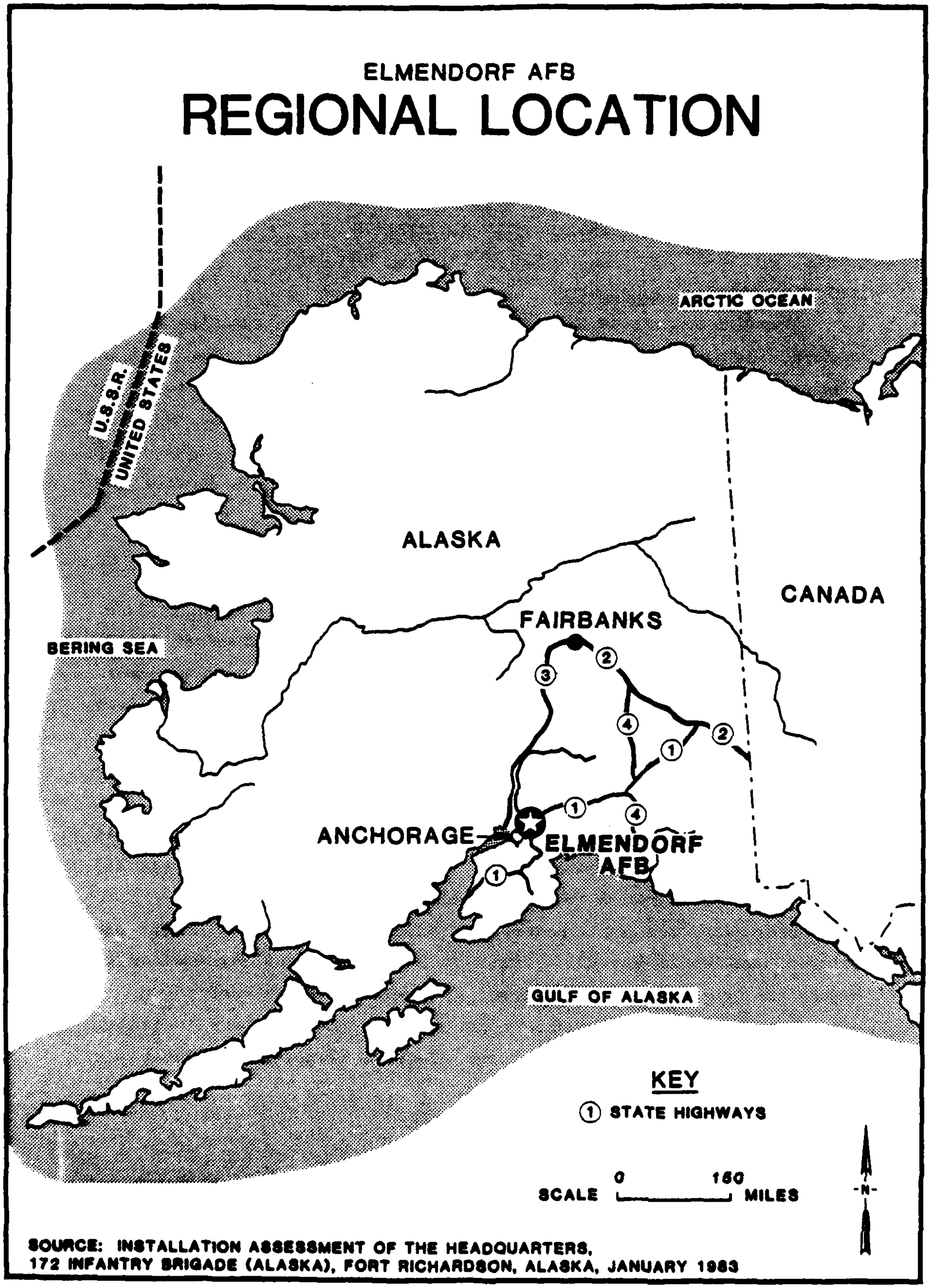


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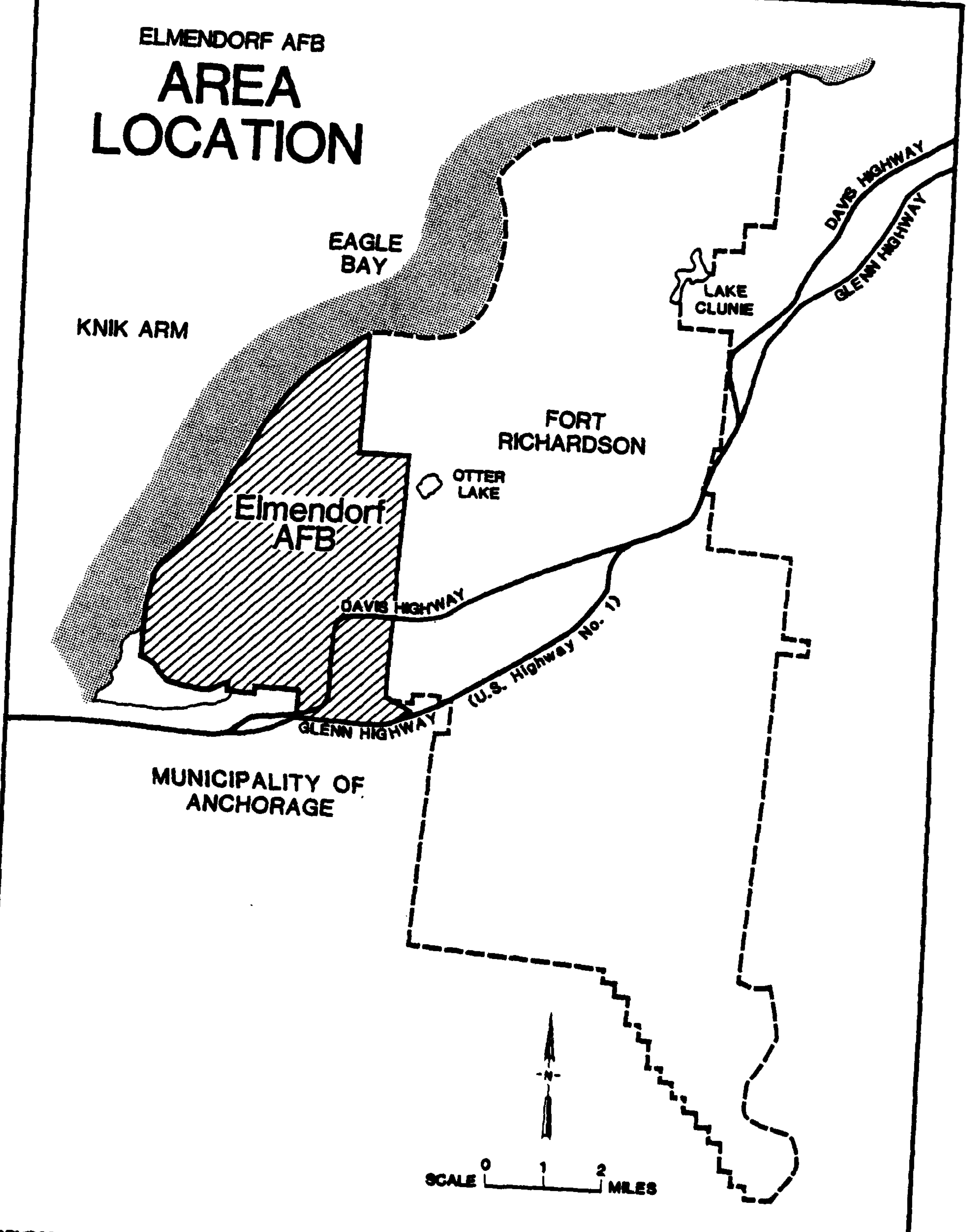
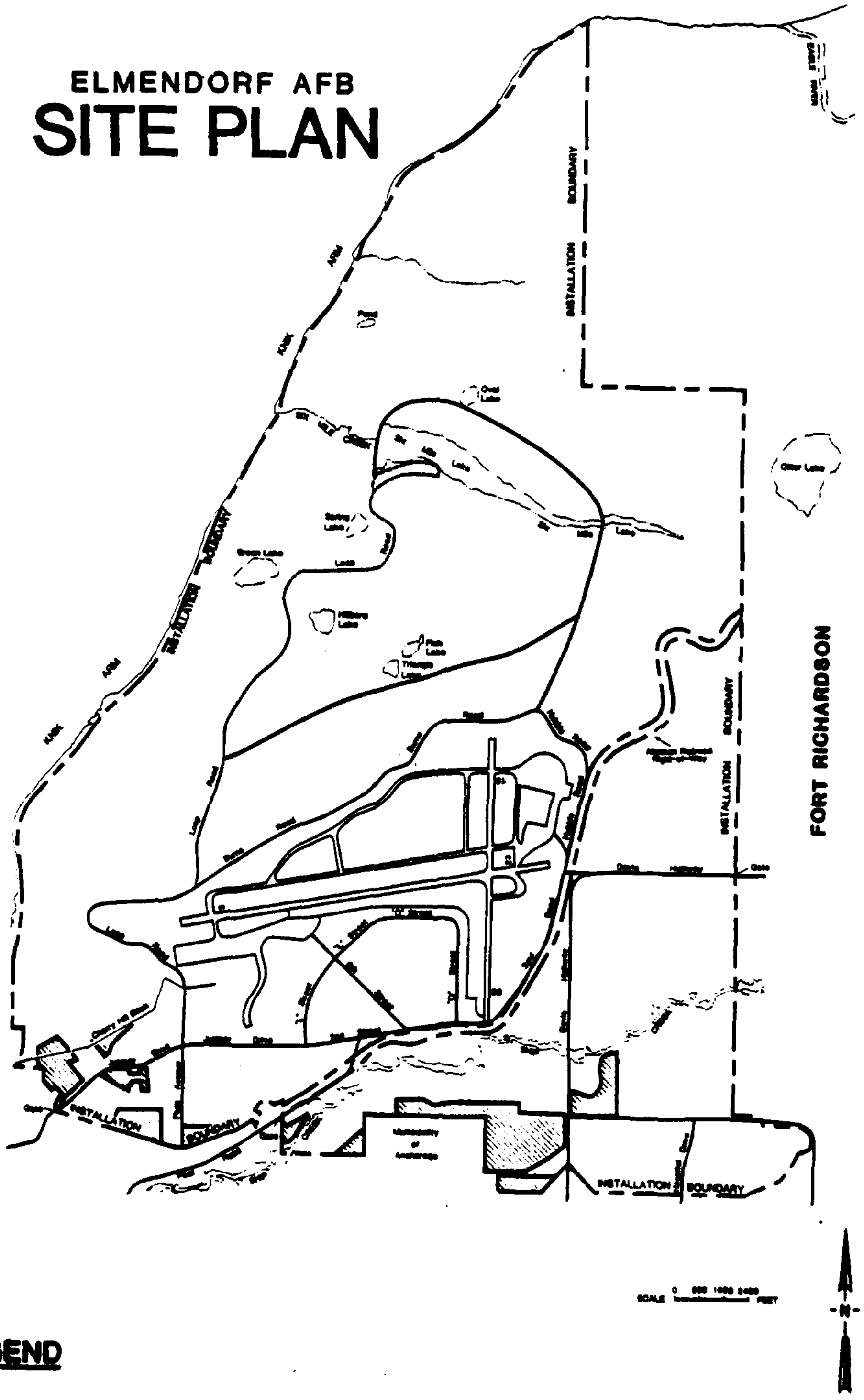
FIGURE 2.2



SOURCE: U.S. DEFENSE MAPPING AGENCY. TOPOGRAPHIC CENTER, 1973

ES ENGINEERING - SCIENCE

FIGURE 2.3



LEGEND

OUT-GRANT

SOURCE: ELMENDORF AFB INSTALLATION DOCUMENTS

Following World War II, Elmendorf assumed an increasing role in the defense of North America as the uncertain wartime relations between the United States and Russia deteriorated into the Cold War.

The late 1940s and early 1950s saw a major buildup of air defense forces in Alaska. The propeller-driven F-51s were replaced with F-80s, which in turn were replaced in succession by F-94s, F-89s, and F-102s. An extensive aircraft control and warning radar system was constructed with sites located throughout Alaska's interior and coastal regions. The White Alice Communications System was built to provide reliable communications. The Alaskan NORAD Region Control Center at Elmendorf served as the nerve center for all air defense operations in Alaska.

The air defense forces reached their height in 1957 with almost 200 fighter aircraft assigned to eight fighter interceptor squadrons located at Elmendorf AFB and Ladd AFB. These were controlled by 18 aircraft control and warning (AC&W) radar sites.

The late 1950s and early 1960s saw a major decline in air defense forces in Alaska because of mission changes and the increasing Soviet ICBM capabilities. Elmendorf began providing more support to other Air Force commands, particularly MAC C-5 and C-141 flights to and from the Far East.

The steady decline in air defense forces stabilized in 1966, when the 21st Composite Wing (later redesignated the 21st Tactical Fighter Wing) was activated. The Wing was, and still is, the largest organization in the Alaskan Air Command.

The 1970s marked another turning point in Elmendorf's history with the arrival of the 43rd Tactical Fighter Squadron. The squadron's F-4Es gave AAC an air-to-ground capability which was further enhanced with the reactivation of the 18th Tactical Fighter Squadron during 1977. The 18th Tactical Fighter Squadron was transferred to Eielson AFB in January 1982, and assigned to the 343rd Composite Group. The first F-15s to the 43rd Tactical Fighter Squadron began arriving in March, 1982, and the replacement of the F-4's to F-15's was completed by late 1982.

ORGANIZATION AND MISSION

The present host organization at Elmendorf AFB is the 21st Tactical Fighter Wing (TFW) which is the largest and principal organization within the Alaska Air Command. The 21st TFW's mission is to provide air superiority for Alaska and the North American continent. Additionally, the wing operates and maintains Elmendorf AFB and supports the various tenant units at the base.

The tenant organizations at Elmendorf AFB are listed below. Descriptions of the major base tenant organizations and their missions are presented in Appendix C.

- Alaskan Air Command, Headquarters
- 1931st Communications Group (Air Force Communications Command)
- 6981st Electronic Security Squadron (Electronic Security Command)
- 616th Military Airlift Group (Military Airlift Command)
- 71st Aerospace Rescue and Recovery Squadron (Military Airlift Command)
- 11th Weather Squadron (Military Airlift Command)
- 11th Tactical Control Group (Alaskan Air Command)
- Detachment 1, 11th Weather Squadron (Military Airlift Command)
- Detachment 5, 1369th Audiovisual Squadron (Military Airlift Command)
- Air Force Arctic Broadcasting Squadron
- Army & Air Force Exchange Service
- Detachment 1422, Air Force Audit Agency
- Detachment 919, 3751st Field Training Squadron (Air Training Command)
- Detachment 2010, Air Force Office of Special Investigations, Naval Security Group Activity
- Defense Communications Agency, Alaskan Region
- Department of Defense Contract Audit Agency
- Military Sealift Command Office
- National Security Agency, Alaska
- Air Force Office of Industrial Relations
- U.S. Army Corps of Engineers, Alaska District
- U.S. Air Force Hospital, Elmendorf AFB

SECTION 3

ENVIRONMENTAL SETTING

The environmental setting of Elmendorf Air Force Base (EAFB) is described in this section with the primary emphasis directed toward identifying features that may facilitate the movement of hazardous waste contaminants from the installation. Environmentally sensitive conditions pertinent to the study are highlighted at the end of this section.

METEOROLOGY

Temperature, precipitation, snowfall and other relevant climatic data furnished by Detachment 1, 11th Weather Squadron, Elmendorf Air Force Base are presented as Table 3.1. The indicated period of record is 35 years. The summarized data indicate that mean annual precipitation is 15.5 inches.

The installation is situated in a transitional climatic zone between the maritime climate effects to the south and the interior, or continental climate zone to the north. The transitional zone experiences a reasonably moderate climate, generally lacking extremes in precipitation, temperature, etc.

GEOGRAPHY

Elmendorf Air Force Base is located within the Cook Inlet-Susitna Lowland subdivision of the Coastal Trough Physiographic Province. The Cook Inlet-Susitna subdivision is a glaciated lowland bordered by mountains inland and the Cook Inlet seaward. The lowland is characterized by areas of ground moraine and general stagnant ice topography, drumlin fields, eskers and outwash plains (Wahrhaftig, 1965). A major glacial feature, the Elmendorf Moraine, extends west-east across the base. Broad alluvial channels may also be observed, such as those at Eagle

TABLE 3.1
ELMENDORF AFB CLIMATIC CONDITIONS
Period of Record: March 1941-May 1976

MONTH	Temperature (°F) Mean Daily Max	Mean Daily Min	Mean Monthly	Extreme Max	Extreme Min	Precipitation (In) Monthly Mean	Monthly Max	Monthly Min	Max 24 Hrs	Snowfall (In) Monthly Mean	Monthly Max	Max 24 Hrs
Jan	18	3	11	49	-38	1.0	2.6	#	1.2	11	29	12
Feb	25	9	17	58	-43	.8	1.7	#	.9	10	26	10
Mar	31	14	23	51	-24	.9	2.7	.1	1.9	10	34	13
Apr	43	28	36	65	-20	.6	3.0	#	.8	5	30	10
May	54	39	47	80	0	.6	3.5	#	3.2	#	3	3
Jun	62	47	55	86	33	1.0	3.7	.0	1.3	0	0	0
Jul	65	52	58	83	34	2.0	4.9	.0	1.6	0	0	0
Aug	63	49	57	82	29	2.2	5.0	.0	1.6	0	0	0
Sep	55	42	49	74	20	2.4	6.3	.0	1.5	#	2	2
Oct	41	28	35	63	-6	1.6	3.4	.2	1.1	7	23	9
Nov	27	14	20	57	-20	1.1	2.9	.1	1.6	11	40	15
Dec	20	6	13	53	-34	1.3	3.0	.1	1.0	14	46	8
Annual			35			15.5				68		

#: Trace
Source: Detachment 1, 11th Weather Squadron, Elmendorf AFB.

River and Ship Creek. Rolling upland areas mark the subdivision margins at the bordering mountain ranges. Figure 3.1 depicts the major physiographic provinces of Alaska.

Topography

Most lowland elevations remain less than 500 feet, MSL, and rolling uplands adjacent to the Chugach Mountains occasionally rise to some 3000 feet, MSL. Regional relief varies from 50 to 250 feet (Wahrhaftig, 1965).

Installation airfield elevations average 213 feet, MSL (from Installation drawing C-2, dated 1982). Study area elevations reach a maximum of 375 feet, MSL along the crest of the Elmendorf Moraine at building number 42-500. The minimum study area elevation is 0 feet, MSL, along the shore of Knik Arm, where the greatest relief, approximately 150 feet, may be observed. Area relief is generally the product of erosional effects and stream channel development.

Drainage

All regional drainage is directed from the bordering mountain slopes, across the lowland surface via area streams to Cook Inlet. Most installation drainage is accomplished by overland flow to diversion structures, to westward flowing streams and finally terminating at Knik Arm of Cook Inlet. Interior drainage may be directed to local ponds or lakes. A small percentage of base urban area drainage is directed to numerous drywells, which are shown on Figure 3.2.

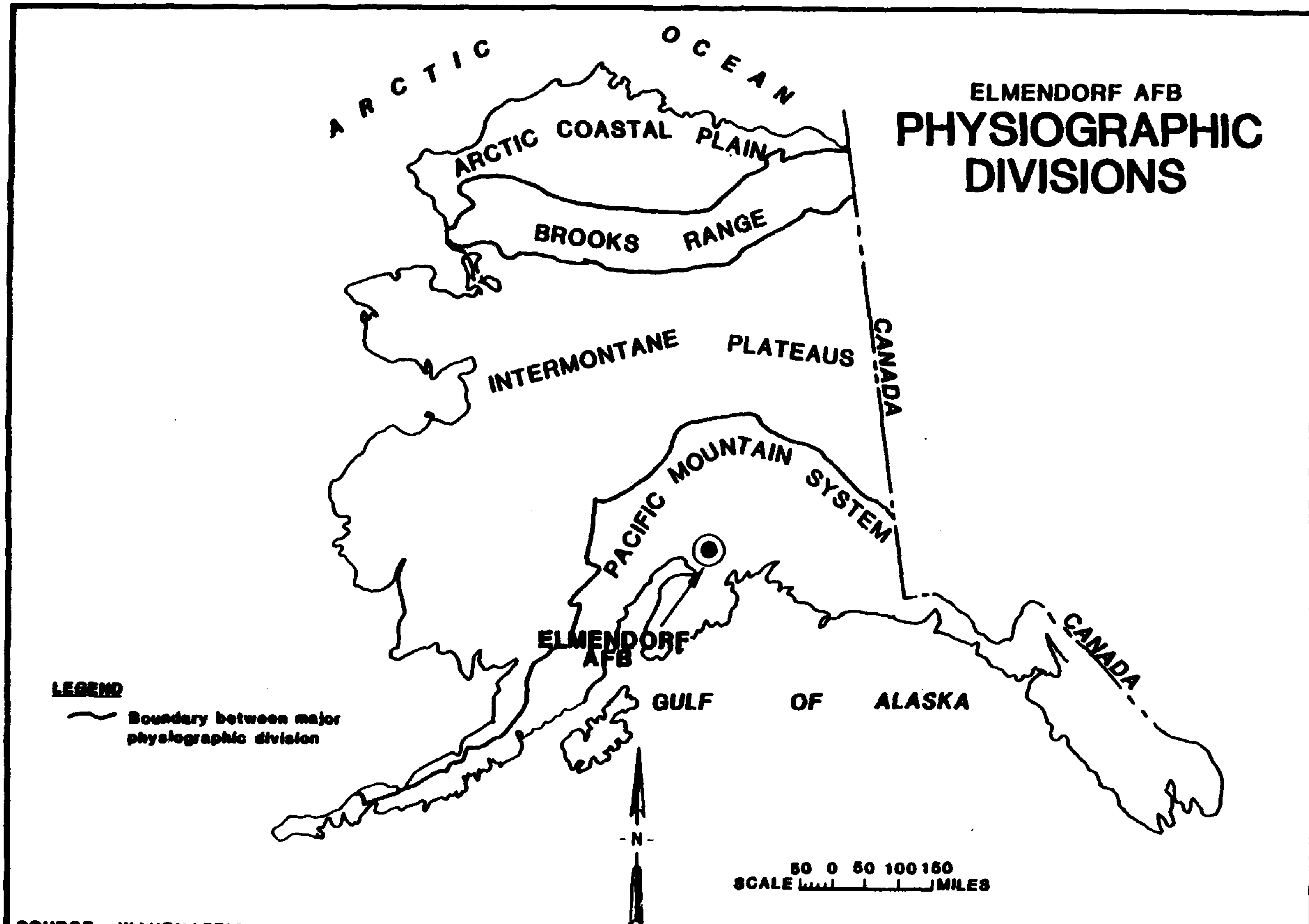
The mean annual runoff from the Ship Creek Basin, measured at the Fort Richardson diversion dam is equivalent to 23 inches of precipitation over the basin, despite the fact that the general area precipitation is approximately 15 inches. This obviously substantial increase in runoff is assumed due to greater precipitation at higher elevations, snowmelt and ground-water discharge.

Flooding is generally restricted to several zones immediately adjacent to Ship Creek. Figure 3.2 depicts installation drainage and the estimated potential flood zone of a 100-year event for the Ship Creek Channel. Flooding is not known to be a problem for other base areas.

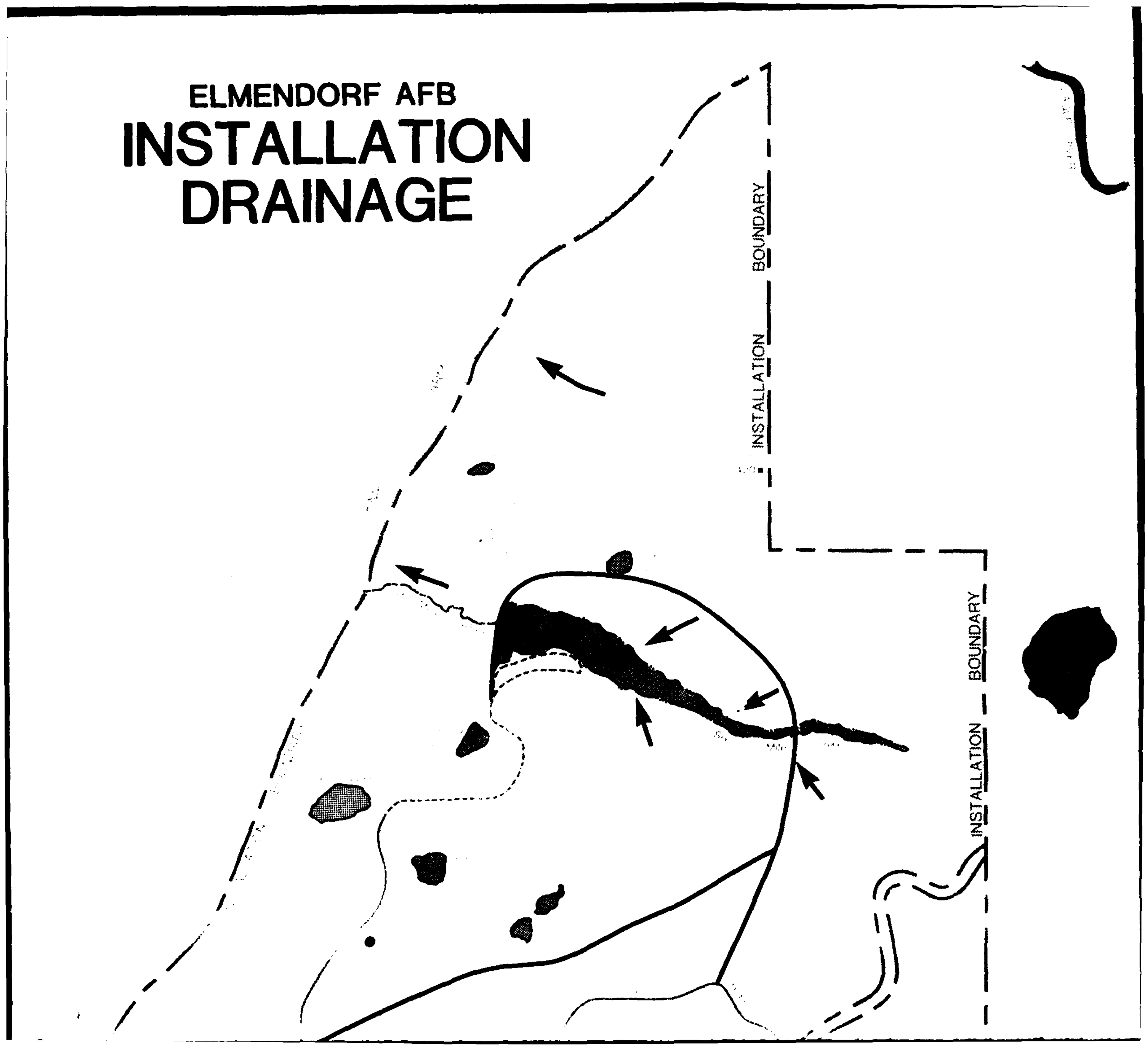
Numerous zones of saturated soil, ponds and a few small lakes have developed on installation property, where topographic influences restrict surface drainage and local relief is prominent. Figure 3.3

FIGURE 3.1

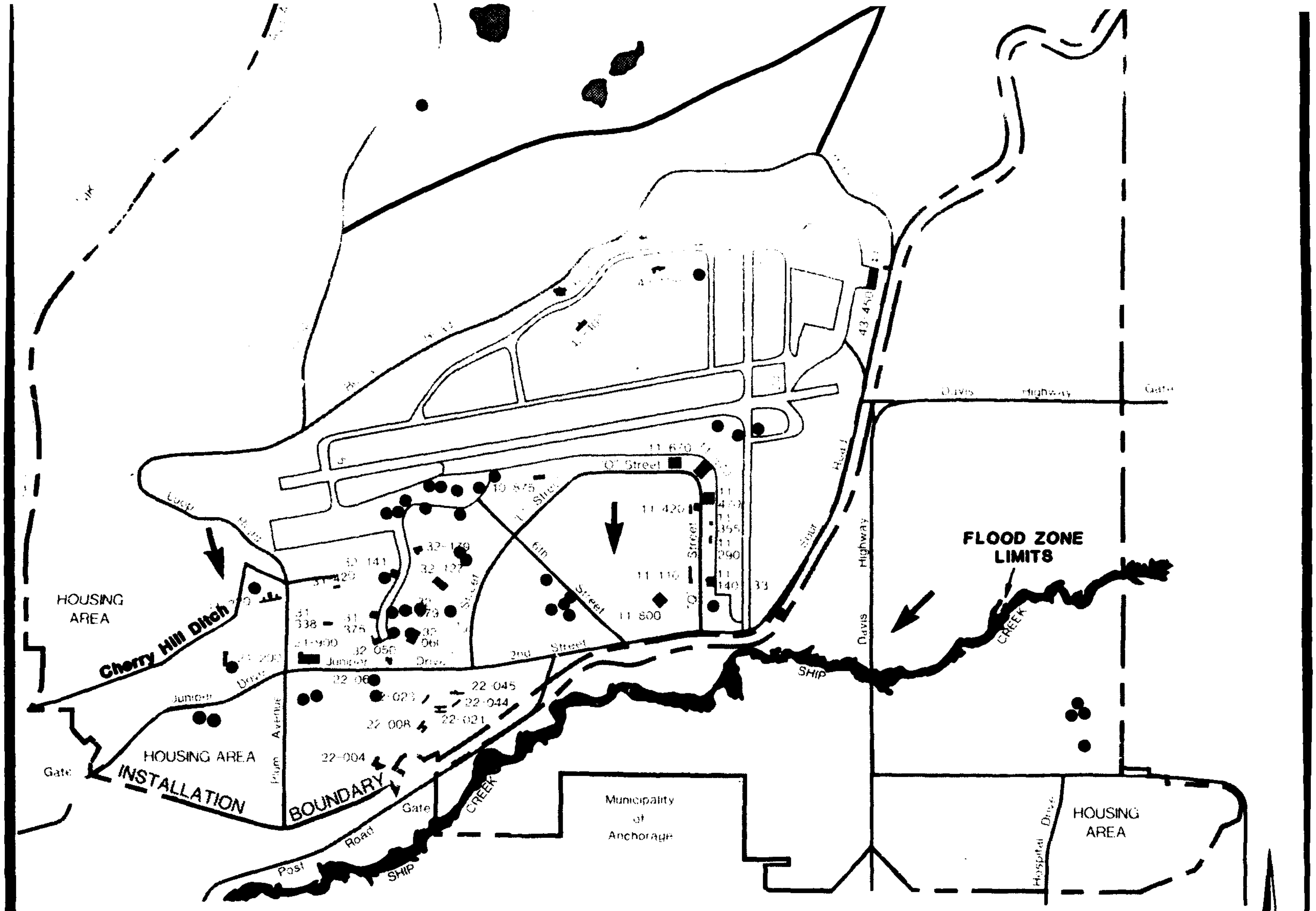
ELMENDORF AFB PHYSIOGRAPHIC DIVISIONS



SOURCE: WAHRHAFTIG, 1965



ELMENDORF AFB
INSTALLATION
DRAINAGE
INSTALLATION BOUNDARY
INSTALLATION BOUNDARY

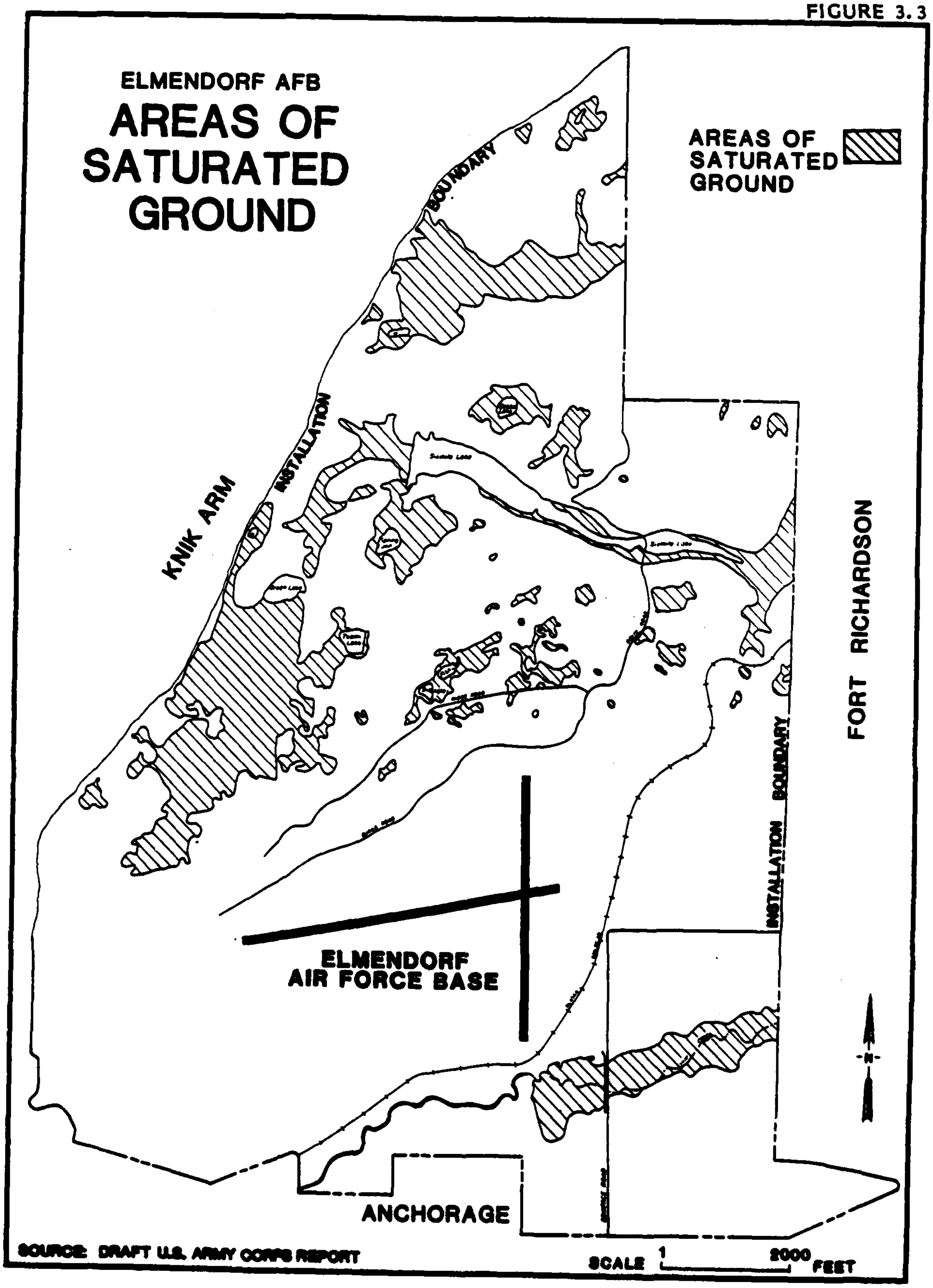


LEGEND

● DRY WELLS

SOURCE: INSTALLATION DOCUMENTS, 1983 AND U.S. ARMY CORP OF ENGINEERS SPECIAL FLOOD HAZARD INFO., 1980

FIGURE 3.3



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depicts these areas. The areas of saturated ground were identified by the Corp of Engineers in a draft report as requiring further investigation for determination of wetlands.

Surface Soils

Surface soils of the northern portion of the base were studied by the USDA, Soil Conservation Service (1979). Soils of this portion of the base are typically upland varieties formed over dense gravelly till, occasionally possessing a thin veneer of loess. These soils are usually well-drained and suitable for most uses. Flatland soils, those occupying mid-slope level areas, tend to be sandy, good to moderately well drained and usually suitable for development. Lowland soils are typically fine-grained, poorly drained, possess high water tables and may be subject to flooding. Lowland soils usually occupy swales, depressions, drainage ways or those areas where surface drainage is restricted. They have normally developed over compact glacial till. Shallow basins within lowland areas may contain peat deposits, which are usually saturated throughout the year.

GEOLOGY

Information describing the geologic setting of Elmendorf AFB has been summarized from Cederstrom et. al. (1964); Schmoll and Dobrovolny (1972 and 1973); and Beikman (1980). Additional information was obtained from interviews with U.S. Geological Survey and Alaska Division of Geological and Geophysical Surveys personnel. A brief overview of the geologic information relevant to this study follows.

Regional Geology

The Anchorage plain is a large alluvial fan set on the east shore of a wide estuarine basin whose prominent margins are formed by the Kenai, Chugach, Talkeetna, Tordrillo and Chigmit Mountains. Regional bedrock is exposed east of the study area along the Chugach Mountain flanks. Here bedrock is principally undifferentiated Mesozoic age metamorphic materials, including slate, sandstone and miscellaneous volcanic rocks. Deep wells fully penetrating Anchorage area unconsolidated deposits have encountered Tertiary sedimentary rocks of the Kenai Group. This consolidated unit unconformably overlies the Mesozoic metamorphics and consists principally of siltstone, coal, sandstone and conglomerate.

The Tertiary sequence forms the bedrock surface which apparently slopes abruptly away from its exposure in the Chugach foothills towards Knik Arm (Cederstrom et.al., 1964). The steepness of the bedrock surface is probably due in part to the Border Ranges Fault (Beikman, 1980) which extends along a north-south alignment, just east of Anchorage t the base of the Chugach Mountains. The Border Ranges Fault was apparently not a factor in the March, 1964 Alaskan Earthquake (Anon., 1964).

The regional consolidated geologic units are overlain in most lowland areas by substantial accummulations of unconsolidated deposits. The unconsolidated materials, principally glacial drift, were deposited during several glacial episodes in Pleistocene time. A test well (number 2) drilled near Elmendorf AFB building 22-001 indicated that study area unconsolidated deposits were some 764 feet thick before bedrock (Tertiary-age Kenai Group sedimentary rocks) was encountered. Immediately below the Kenai Group are Mesozoic age metamorphic rocks. The metamorphics are a complex mixture of marine sedimentary and igneous materials that have been deformed by exposure to temperature and pressure extremes.

Stratigraphy and Distribution

The surface distribution of major geologic units present on the installation are shown on Figure 3.4, which is based on work by Schmoll and Dobrovolny (1972). The individual geologic units are briefly described on Table 3.2. Generally, the geology of Elmendorf AFB is dominated by two primary types of unconsolidated deposits. Coarse grained, fairly well-sorted stream and delta deposits predominate in the southern (flatland) portion of the base. These materials are the relatively clean sands and gravels associated with stream channel development or glacial outwash. Fine grained, poorly sorted glacial materials dominate the northern (upland) section of the base. These deposits consist of heterogeneous mixtures of boulders, cobbles, gravel, sand, silt and clay that form the hilly morainal topography. The contacts between individual geologic units shown are approximate and may vary somewhat in the field. The total thickness of unconsolidated materials is estimated to average 800 feet in most of the study area.

FIGURE 3.4

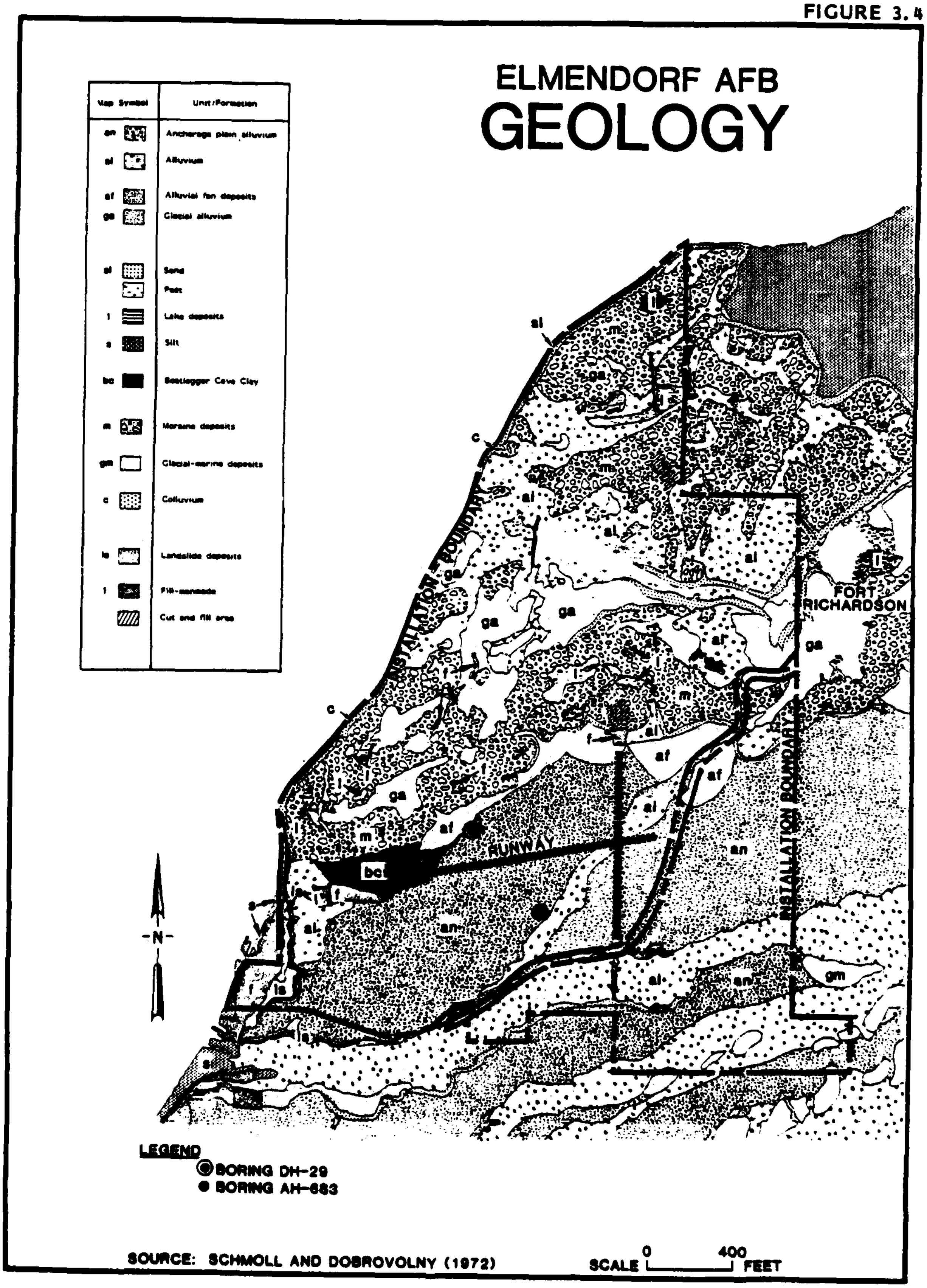

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TABLE 3.2
ELMENDORF AIR FORCE BASE GEOLOGIC UNITS

ERA	System	Series	Map Symbol	Unit/Formation	Approximate Thickness In Feet	Lithology/Remarks
Cenozoic	Quaternary	Holocene	an	Anchorage plain alluvium	0-100+	Well sorted and bedded gravel and sand.
			al	Alluvium	0-100+	Well sorted and bedded sand and gravel in abandoned and modern stream channels.
			af	Alluvial fan deposits	0-100+	Well sorted gravel and sand.
		Pleistocene	ga	Glacial alluvium	0-100+	Occasionally sorted, usually heterogeneous gravel; sand, silt and clay deposits forming distinct glacial topographic features: kames, eskers and kame terraces.
			sl	Sand	0-20	Well bedded sand along Knik Arm.
				Peat	5-30	Thin peat accumulations in low areas.
			l	Lake deposits	10-50	Lake and pond deposits of silt and clay, underlying peat. Some marl.
			s	Silt	0-40	Includes organic silts and clays deposited in estuaries, tidal zones and in lowlands.
			bc	Bootlegger Cove Clay	0-200	Primarily clay and silt with pebbles, cobbles and boulders. Exposed along sea bluffs and valley walls.
			m	Moraine deposits	0-100	Moraine deposits form the low-ridges marking glacial limits. Poorly sorted sand, gravel, silt and clay.
			gm	Glacial-marine deposits	0-50	Poorly sorted boulder, gravel, sand, silt and clay deposits forming elongate hills southeast of base.
			c	Colluvium	Varies	Usually unsorted boulders, gravel, sand, silt and clay that has moved downslope in narrow bands from valley walls as slippage or in unchannelized flow.
			ls	Landslide deposits	Varies	Gravel and sand glide-blocks overlying thick clay and silt beds (unit bc, described above).
			f	Fill - manmade	Varies	Includes unconsolidated natural materials and debris.
				Cut and fill area	Varies	Area of extensive topographic and geologic alteration due to construction or site use modification.

Source: Modified from Schmoll and Dobrovolny (1972)

Figure 3.5 is a simplified subsurface cross-section along the alignment of Ship Creek, which is used to illustrate the vertical distribution of study area geologic units. The obvious separation of "clean" sand and gravel layers by dense till is implied but is not always the case. The till layers, while probably continuous in many areas, are most likely discontinuous or completely absent locally. Many units may tend to grade gradually into one another, both horizontally and vertically. Cederstrom et. al. (1964) reported on the difficulty of correlating buried sand layers with assurance over even short distances, especially where the buried sands are enclosed in till. Most of the sand strata occur as elongate lenticular deposits, many of which may not extend beyond one mile in length. Their origin and rapid deposition beneath or in front of retreating ice within areally-controlled channels, probably explains this. Except where extensive outwash plain deposits are present (geologic unit "an" on Figure 3.4), the chance that one unit correlates directly to another is slight. Usually, buried sands may intersect one another, may pinch out or be imperfectly separated by intervening till sequences.

Figures 3.6 and 3.7, are the logs of installation test borings DH-29 and AH-683, respectively. It can be seen that although both borings were begun in Anchorage plain alluvium (refer to Table 3.2 and Figure 3.4), subsurface conditions vary over short distances. DH-29 encountered a member of the Bootlegger Cove Clay at a depth of 19.2 feet below ground surface, while this unit was not encountered further to the south by boring AH-683.

Apart from a gentle westward dip apparent in Quaternary materials, no obvious significant structural features that impact water movement are known to exist. The unconsolidated units are not known to be faulted (other than isolated landslide glide-blocks) or folded.

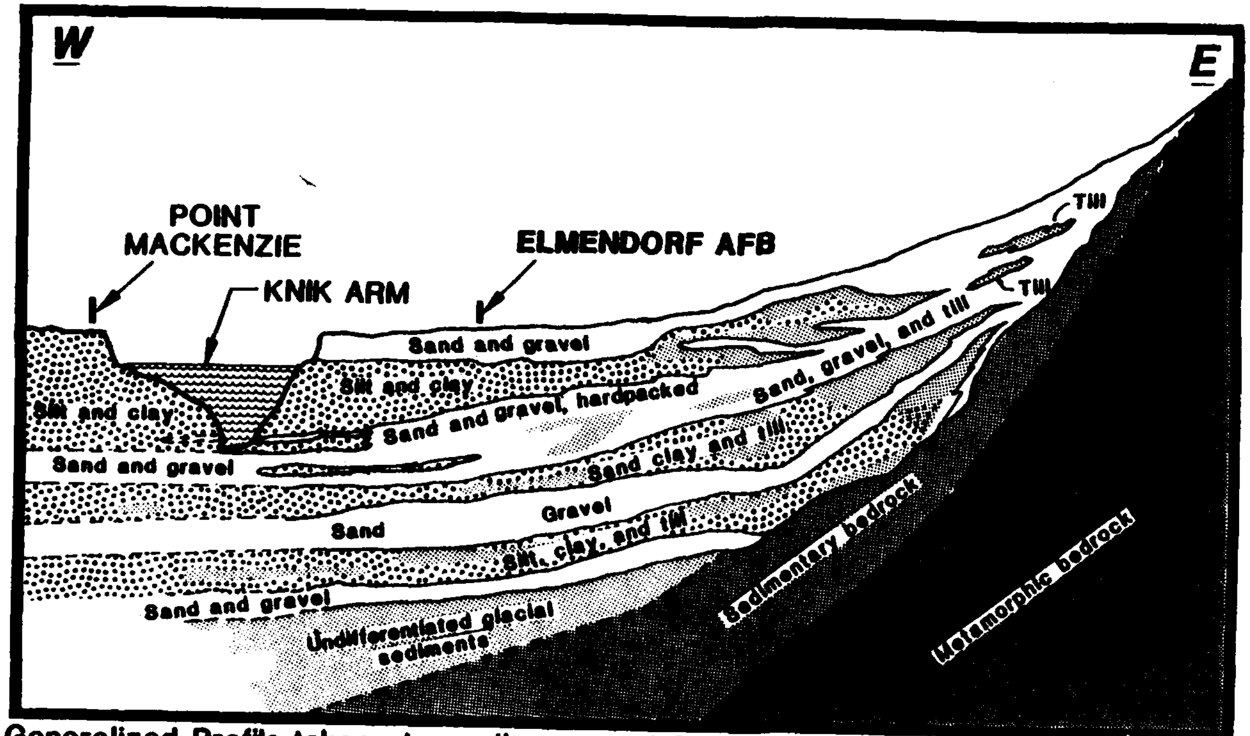
HYDROLOGY

Ground-water hydrology of the study area has been reported by Cederstrom et. al. (1964); Weeks (1970); Barnwell et. al. (1971); Selkregg et. al. (1972); Dearborn and Barnwell (1975); Freethey (1976); Zenone and Anderson (1978); Meyer and Patrick (1980); and Freethey and

FIGURE 3.5

ELMENDORF AFB

GENERALIZED GEOLOGIC CROSS-SECTION ALONG SHIP CREEK

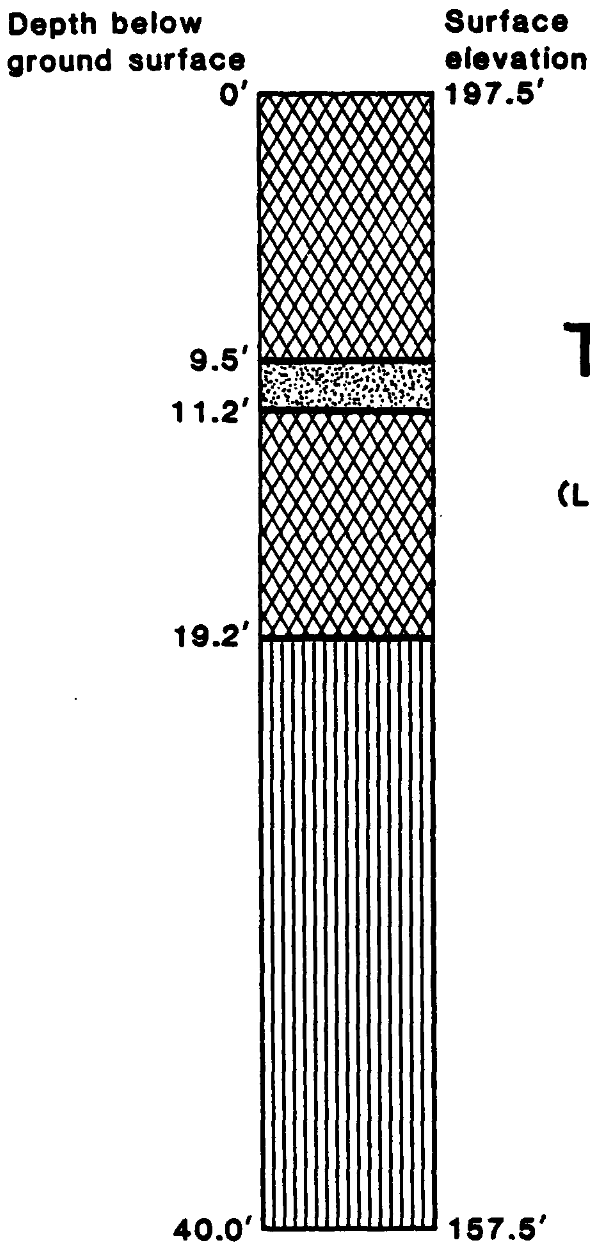


Generalized Profile taken along alignment of Ship Creek

Not to Scale

SOURCE: FREETHEY and SCULLY, 1980

FIGURE 3.6



ELMENDORF AFB

LOG OF TEST BORING NO. DH-29

(Location shown on Figure 3.4)

LEGEND

SILTY SAND

POORLY GRADED SAND

LOW PLASTICITY CLAY
(BOOTLEGGER COVE CLAY)

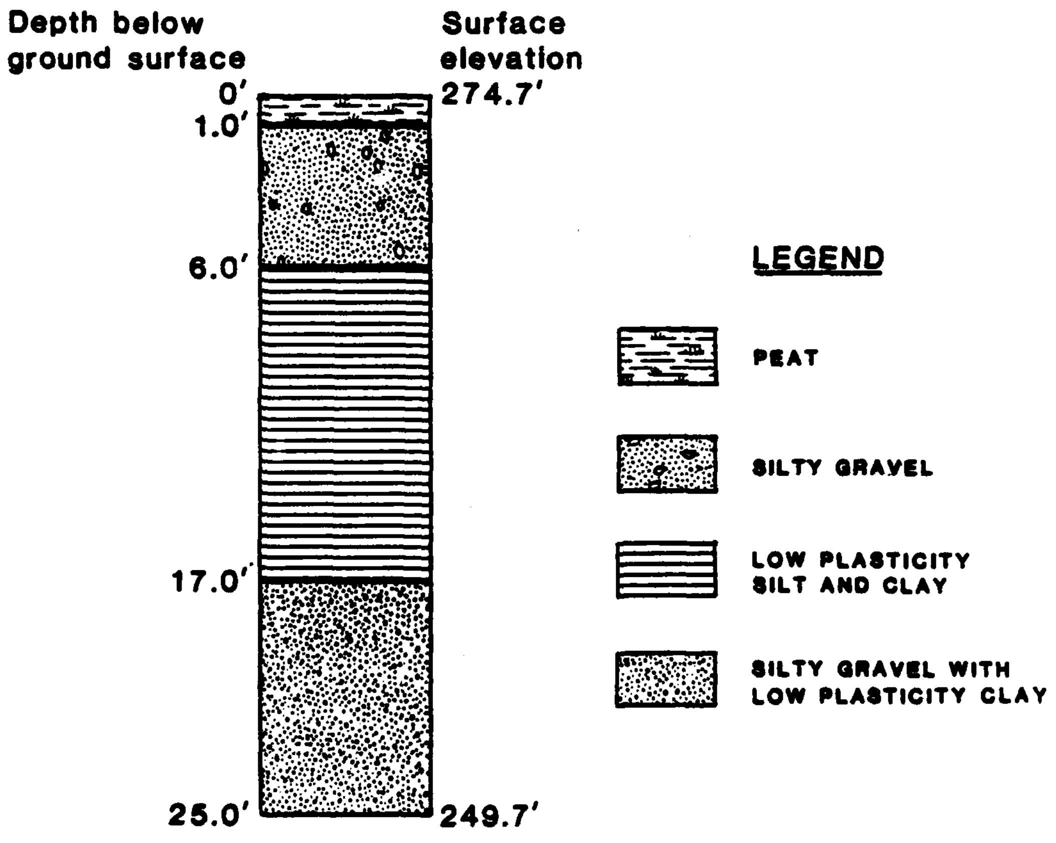
NOTE: GROUND-WATER LEVEL NOT RECORDED.
SOURCE: INSTALLATION DOCUMENTS TAB C-6 (1961)

FIGURE 3.7

ELMENDORF AFB

LOG OF TEST BORING NO. AH-683

(Location shown on Figure 3.4)



NOTE: GROUND-WATER LEVEL NOT RECORDED.

SOURCE: INSTALLATION DOCUMENTS TAB C-6 (1981)

Scully (1980). Additional information has been provided by U.S. Geological Survey Water Resources Division and Anchorage Water and Wastewater Utility personnel.

Introduction

Elmendorf AFB is located on the Anchorage plain, a glaciated lowland at the head of Cook Inlet. In this area, two major sources of ground-water supplies have been identified. The aquifers of particular interest to this investigation are:

- Shallow Aquifer (Four units described)
- Artesian Aquifer (Three units described)

Water, originating as precipitation, snow melt or leakage through streambeds enters the ground-water system, primarily along the Chugach Mountain front. Both aquifers are recharged in this manner. Recharge to the Anchorage area aquifers has been estimated to be equal to five to nine inches of annual precipitation or about thirty to fifty percent of all yearly rainfall (Zenone and Anderson, 1978). Water contained in the aquifers moves down slope under the influence of gravity until it is lost to area streams as base flow, withdrawn by wells or ultimately discharged to Cook Inlet. Figure 3.8 depicts the study area hydrologic cycle.

Shallow Aquifer

The study area shallow aquifer is composed of alluvial fan, alluvial and outwash deposits, morainal (till) deposits and tidal deposits. These units occur at or near ground surface. The areal extent of these shallow aquifers is shown on Figure 3.9. Major characteristics of these aquifers may be summarized as follows (data extracted from Cederstrom, et. al., 1964 and Selkregg, et. al., 1972):

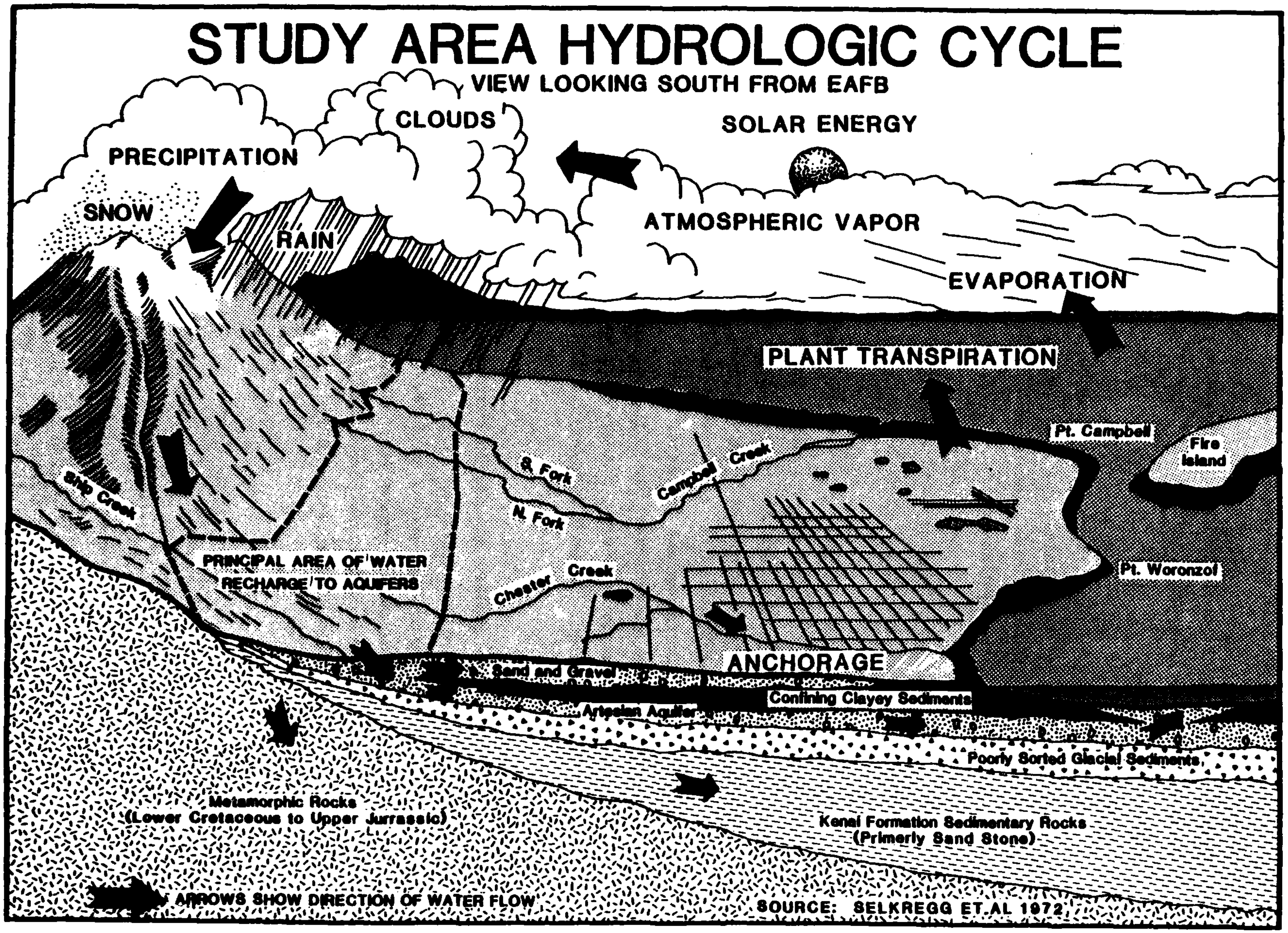
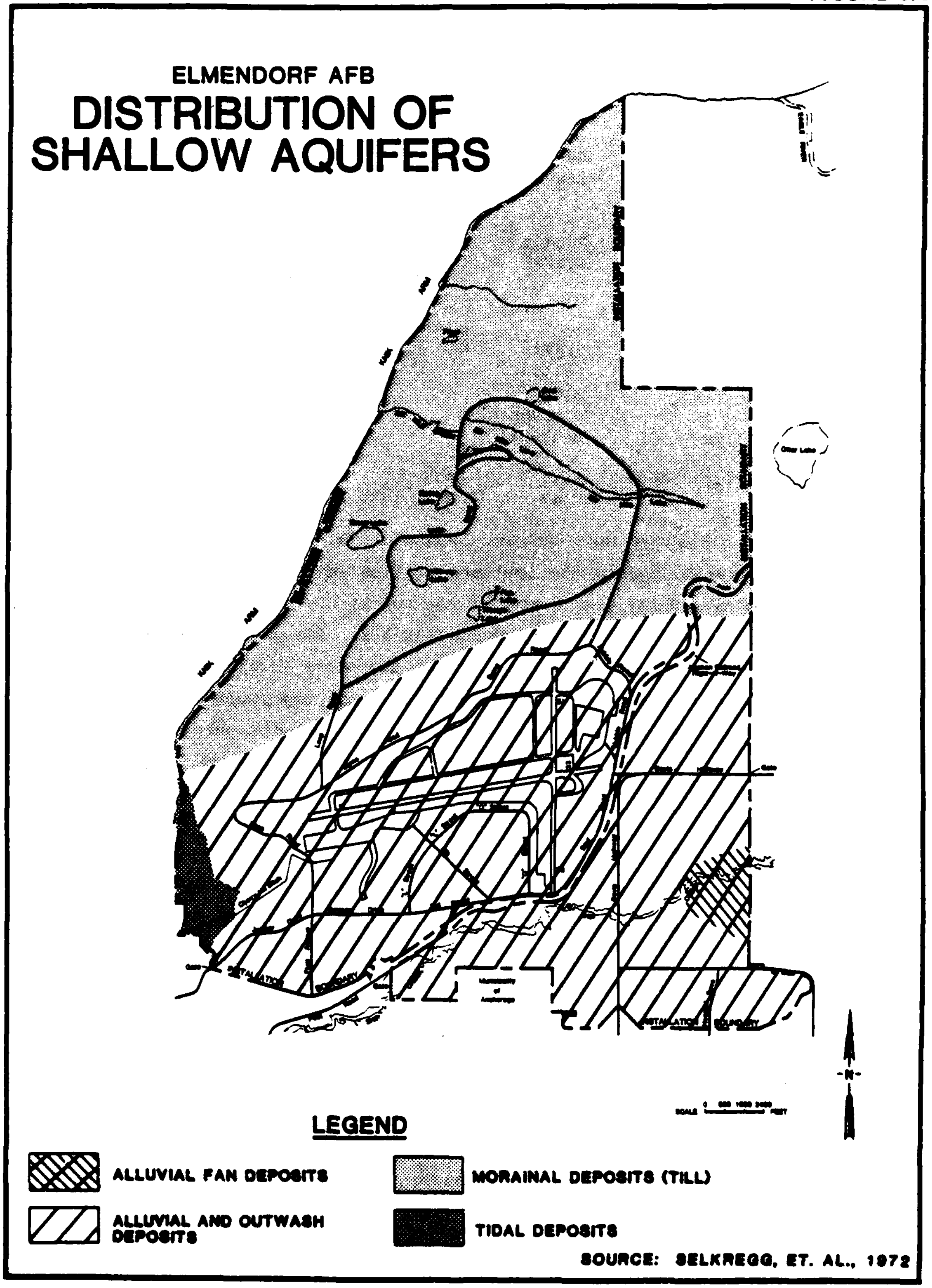

STUDY AREA HYDROLOGIC CYCLE
VIEW LOOKING SOUTH FROM EAFB
CLOUDS
SOLAR ENERGY
PRECIPITATION
SNOW
RAIN
ATMOSPHERIC VAPOR
EVAPORATION
PLANT TRANSPIRATION
Pt. Campbell
Fire Island
S. Fork
Campbell Creek
Ship Creek
N. Fork
PRINCIPAL AREA OF WATER RECHARGE TO AQUIFERS
Chester Creek
Pt. Woronzof
ANCHORAGE
Sand and Gravel
Confining Clayey Sediments
Artesian Aquifer
Poorly Sorted Glacial Sediments
Metamorphic Rocks (Lower Cretaceous to Upper Jurrassic)
Kenai Formation Sedimentary Rocks (Primerly Sand Stone)
ARROWS SHOW DIRECTION OF WATER FLOW
SOURCE: SELKREGG ET.AL 1972

FIGURE 3.8

FIGURE 3.9


ELMENDORF AFB
DISTRIBUTION OF SHALLOW AQUIFERS
INSTALLATION BOUNDARY
LEGEND
ALLUVIAL FAN DEPOSITS
ALLUVIAL AND OUTWASH DEPOSITS
MORAINAL DEPOSITS (TILL)
TIDAL DEPOSITS
SOURCE: SELKREGG, ET. AL., 1972

Hydro-geologic Unit	Topographic Setting	Lithology	Permeability K (cm/sec)	Yield Range (gpm)	Estimated Thickness (feet)
1. Alluvial Fan	Stream Valleys & Lowlands	Sand & Gravel	Very High ($K > 1 \times 10^{-1}$)	500-1500	30-100
2. Alluvial & Outwash	Lowlands	Sand & Gravel	High ($K = 1 \times 10^{-1}$ to 1×10^{-2})	10-100	10-50
3. Moraine (till)	Uplands	Sand, Gravel, Silt, Clay Boulder Mixture	Moderate ($K = 1 \times 10^{-2}$ to 1×10^{-3})	5-50	10-300
4. Tidal	Tidal Zone	Silt & Clay	Low (1×10^{-3} to 1×10^{-2})	Nil	50-250

Figure 3.9 shows that the most permeable and best water producing units are present across the southern portion of Elmendorf AFB. The least productive units are located in the northern section of the base and the bluffs overlooking Knik Arm. The north-south dividing line can be taken as the foot of the Elmendorf Moraine which also indicates the break between lowlands and highlands topography.

Ground water occurs in the shallow units under generally water table, or unconfined conditions, however, locally, shallow units may be semi-confined (Freethey, 1976). Due to topographic controls, the depth to saturation within the individual units varies from ground surface to more than fifty feet. Frequently, shallow aquifer water levels intersect the topographic surface, resulting in ponds, lakes or swamps. Typical base water level depths would be on the order of five feet near Ship Creek to thirty-five feet at the closed landfill near building 34-018. The depth to ground water along the heights of the Elmendorf Moraine may be on the order of fifty to sixty feet below ground surface.

Ground-water flow within the shallow aquifers occurs across the southern part of Elmendorf AFB in a southerly or south-westerly direction, as shown on Figure 3.10. The contour lines pinch out at the northern limit of the alluvial and outwash deposits, as little information is available to discuss flow within the till and tidal units.

FIGURE 3.10

ELMENDORF AFB

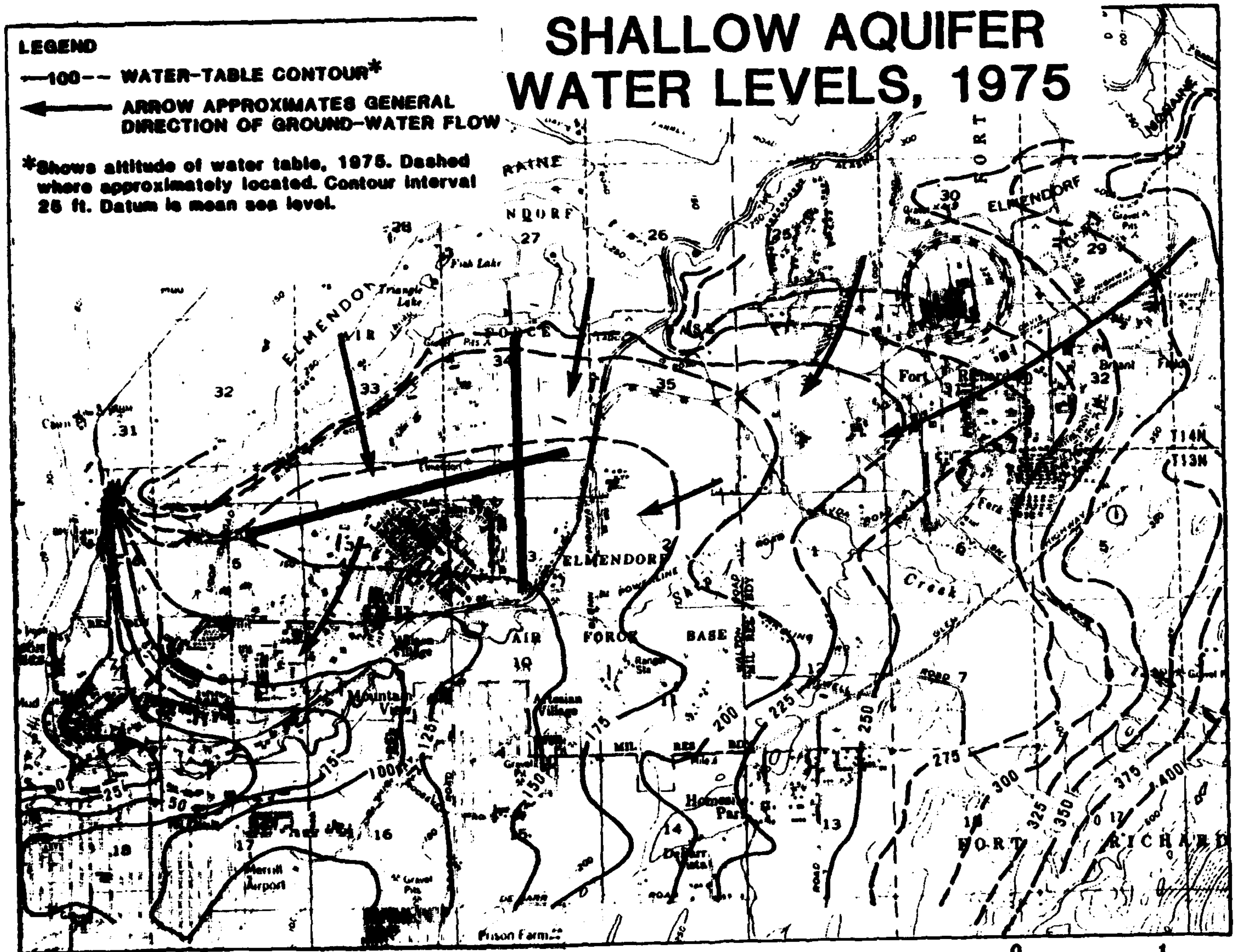
SHALLOW AQUIFER WATER LEVELS, 1975

LEGEND

—100— — WATER-TABLE CONTOUR*

ARROW APPROXIMATES GENERAL DIRECTION OF GROUND-WATER FLOW

*Shows altitude of water table, 1975. Dashed where approximately located. Contour interval 25 ft. Datum is mean sea level.



SCALE 0 — 1 MILE

N

SOURCE: MODIFIED FROM FREETHEY, 1976

According to interpolation of water level maps reported by Barnwell, et. al. (1971), the average hydraulic gradient at the installation is twenty feet per mile. This hydraulic gradient may be described as "moderate".

The shallow aquifer units and Ship Creek share a complex relationship. Substantial amounts of stream flow within Ship Creek, from its rise in the Chugach Mountain front to the Davis Highway, are lost through streambed percolation to the shallow aquifer (either alluvial fan or alluvial and outwash deposits). The lower reach of Ship Creek, from the Davis Highway to Cook Inlet gains ground-water flow according to Weeks, (1970). Thus, Ship Creek is both a losing and gaining stream. Figure 3.11 illustrates this situation in a simplified hydrogeologic cross section drawn along the alignment of Ship Creek.

Ship Creek gains the most shallow aquifer discharge where it is entrenched into the Bootlegger Cove Clay which underlies both the stream in its lower reach and the shallow aquifer. Because of this entrenchment, unconfined ground water is directed to the Creek first, and not permitted to discharge directly to Knik Arm, as one might expect (Freethey, 1976). In practical terms, this means that contamination entering the shallow aquifer anywhere in the southern portion of the base would most reasonably be expected to be discharged to Ship Creek or to the Cherry Hill ditch.

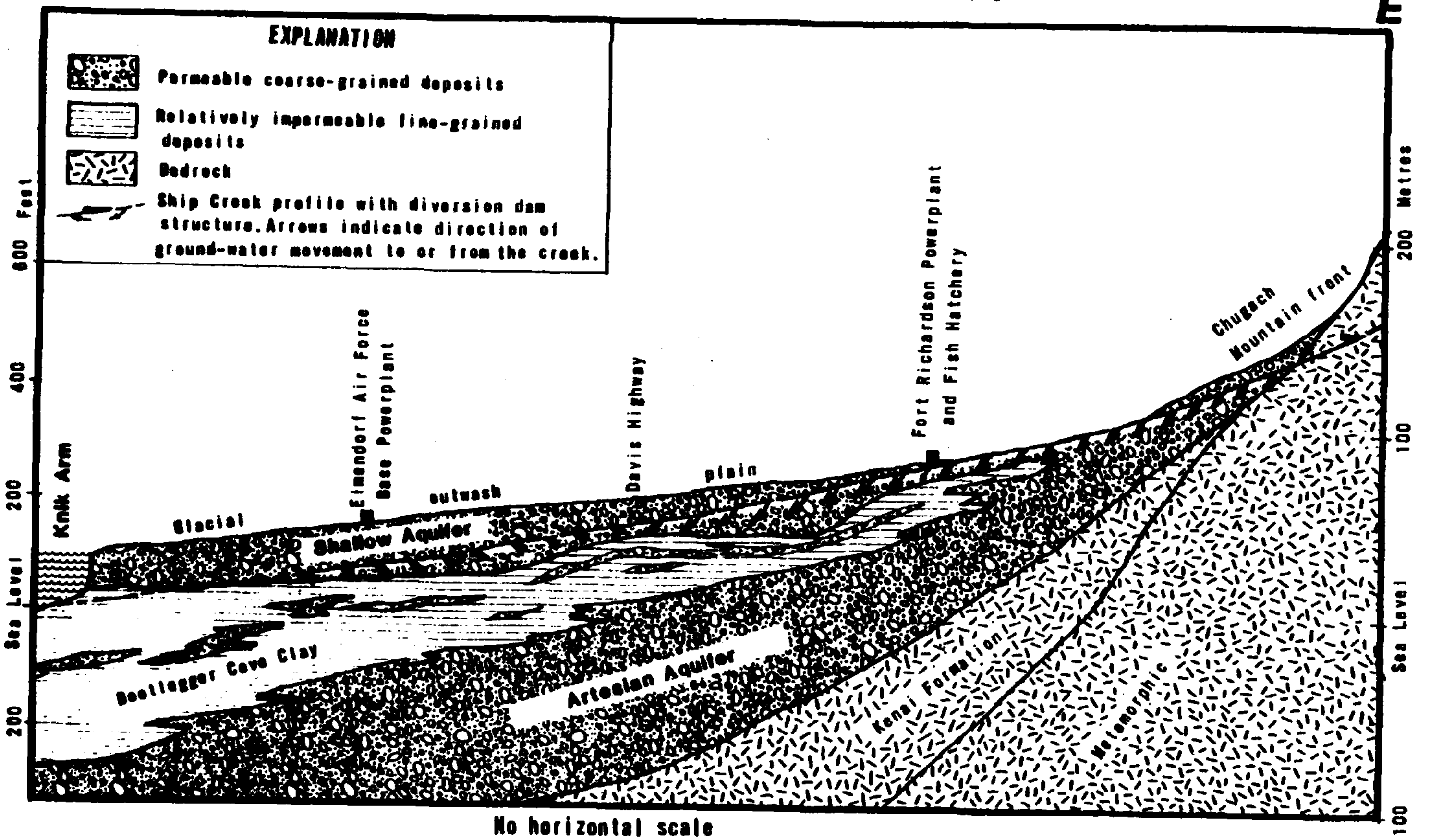
Utilization of shallow aquifer units as a source of potable water supplies has been limited because of contamination problems (reported in Barnwell, et. al., 1971; Selkregg, et. al., 1972 and Cederstrom, et. al., 1964). Formerly, the City of Anchorage obtained five mgd from an infiltration gallery located at Ship Creek within city limits, however its contamination by kerosene forced the closure of this facility. Nelson (1982) reported that the shallow aquifer beneath the Merrill Field municipal landfill was contaminated by leachate originating from that facility. At present, public supplies are obtained from surface waters, such as the headwaters of Ship Creek or through large diameter, high capacity wells finished into the artesian aquifer system, far below the shallow units.

At this time it is believed that some individual homes not served by municipal utilities obtain water supplies from small-diameter wells screened into the shallow zone. Other consumers using shallow aquifer-

FIGURE 3.11

ELMENDORF AFB

SIMPLIFIED HYDROGEOLOGIC CROSS-SECTION ALONG SHIP CREEK



No horizontal scale
Vertical exaggeration approximately x20

SOURCE: MODIFIED FROM FREETHEY, 1976

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derived water supplies include isolated military facilities not connected to the central water distribution system. The primary threat to shallow aquifer water quality in this situation is posed by septic tanks serving the same home or facility. The septic system discharges to the shallow aquifer, while a short distance away a shallow aquifer well withdraws water. The relatively short distances involved rarely permit adequate renovation of local water quality (Selkregg, et. al., 1972).

Ground-water monitoring of alluvial fan shallow aquifer quality below the closed cell of landfill (Site D-7) was reported by Zenone and Anderson (1974) and by Zenone et. al., (1975). The landfill was an abandoned gravel pit located on a terrace of Ship Creek. Local ground-water flow beneath the landfill was reported to be in a west-northwest direction and is shown on Figure 3.12. Ground water was reported to be present some thirty-five feet below ground surface, but was indicated to be only two to three feet below the bottom of the closed landfill cell. A cross-section through the landfill is presented as Figure 3.13. A review of installation documents and published information suggests that ground-water contamination has not been detected (Appendix E, Table E.2). It must be noted that although two wells penetrate the landfill, none have been installed hydraulically down-gradient of the site. In addition, it has been reported that well ESL-2 was damaged by landfill equipment and is no longer in service. Monitoring well screens have been installed some ten feet below the water level reported in 1974, which may be too deep to detect contaminants floating at or near the ground-water surface. In order to obtain reasonable samples of local ground water, monitoring wells must be properly located with respect to disposal facilities and screened sections must be of adequate depth and length to permit the inflow of representative quantities of water passing below the site. The practice of drilling through a closed disposal facility and installing wells at such locations (monitoring wells ESL-1 and ESL-2) is dangerous as improperly constructed wells will provide a new conduit for the rapid migration of contaminants into the shallow aquifer.

<u>Artesian Aquifer</u>

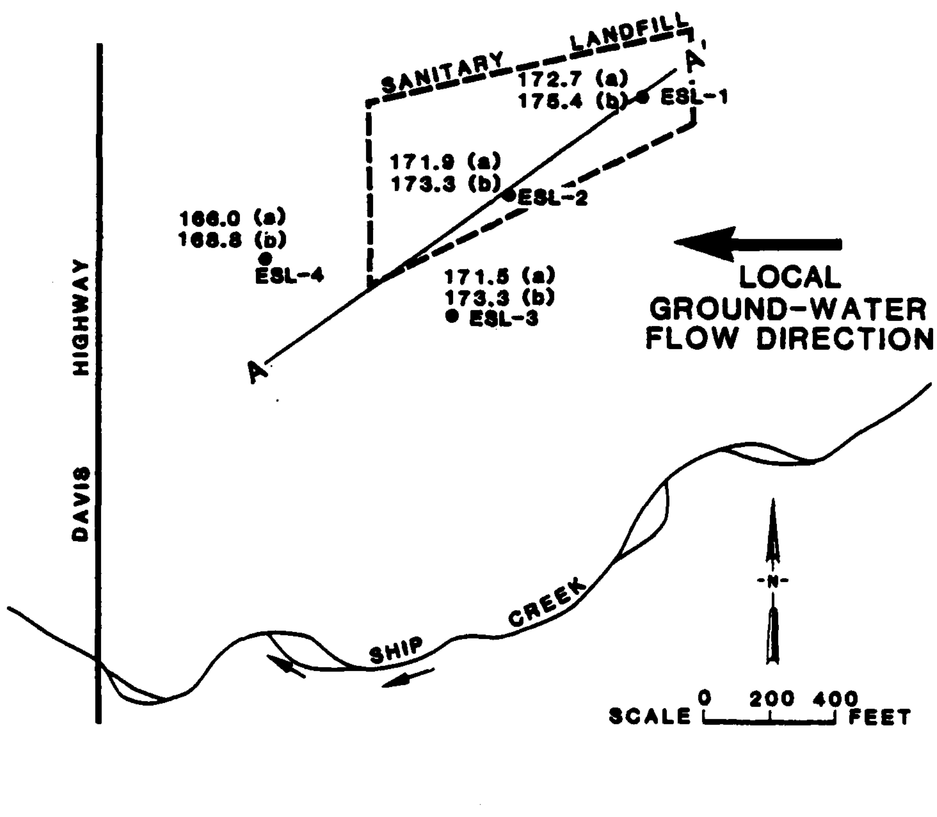
Study area artesian (confined) hydrogeologic units include sand and gravel outwash deposits, alluvial sands and mixed till deposits. These

FIGURE 3.12

ELMENDORF AFB

SHALLOW AQUIFER WATER LEVELS

AT BASE LANDFILL (SITE D-7)



NOTES: (1) TYPICAL LANDFILL LOWER ELEVATION IS 212 FEET, MSL
(2) WATER TABLE ELEVATIONS ARE MSL

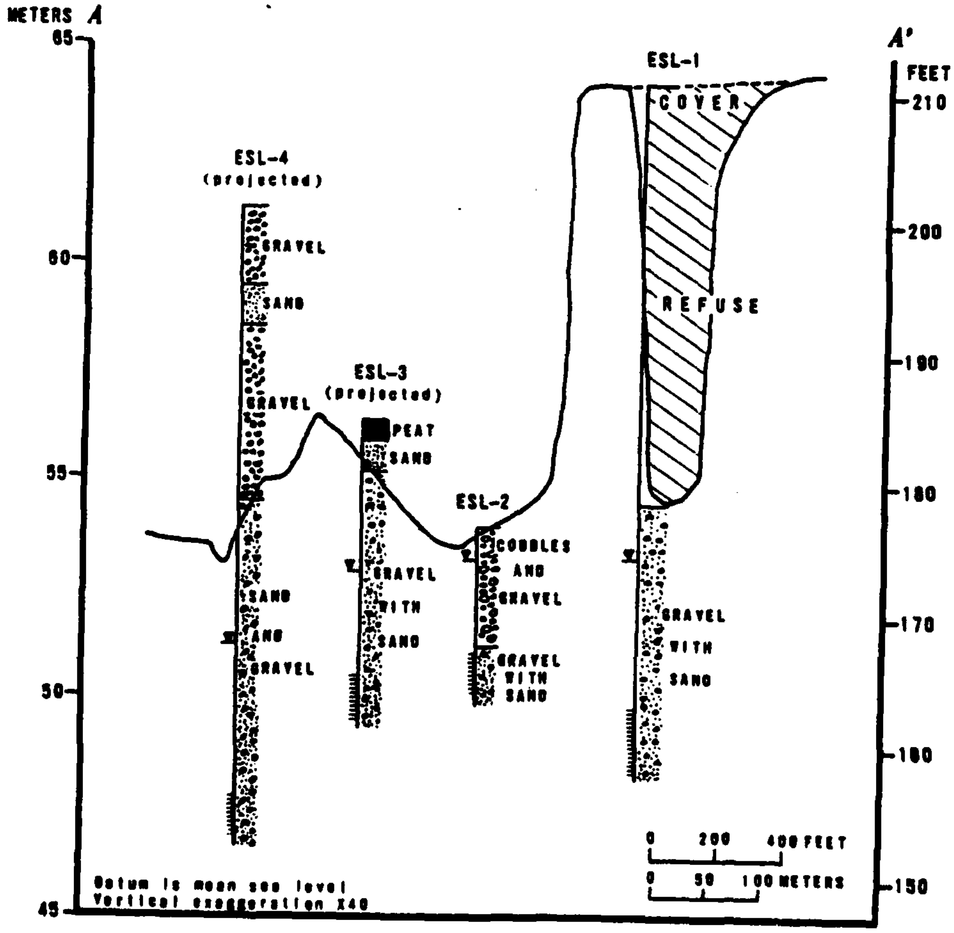
SOURCE: (a) ZENONE AND ANDERSON, 1974 (b) BASE MONITORING AUGUST 24, 1983

FIGURE 3.13

ELMENDORF AFB

HYDROGEOLOGIC SECTION

THROUGH BASE LANDFILL (SITE D-7)



NOTES: (1) LANDFILL CONDITIONS DATED 1974
(2) WELL ESL-2 WAS NOT WITHIN BOUNDARY OF LANDFILL IN 1974. HOWEVER, LATER EXPANSION OF SITE D-7 ENCOMPASSED WELL ESL-2

SOURCE: ZENONE AND ANDERSON, 1974

units occur at moderate depths below ground surface and are typically overlain by substantial thicknesses of confining materials, such as the Bootlegger Cove Clay depicted on Figure 3.11. The areal extent of base artesian hydrogeologic units is shown on Figure 3.12. Major characteristics of these units may be summarized as follows (data obtained from Cederstrom, et. al., 1964 and Selkregg et. al., 1972):

Aquifer	Topographic Setting	Lithology	Depth of Occurence (feet)	Permeability (cm/sec)	Yield Range (gpm)
1. Outwash	Lowlands	Sand & Gravel	100-300	Very High ($K > 1 \times 10^{-1}$)	200-1500
2. Alluvium	Lowlands	Sand	200-400	Moderate ($K = 1 \times 10^{-2}$ to 1×10^{-3})	200-700
3. Till	Uplands	Mixed	50-300	Variable ($K = 1 \times 10^{-1}$ to 1×10^{-7})	5-50

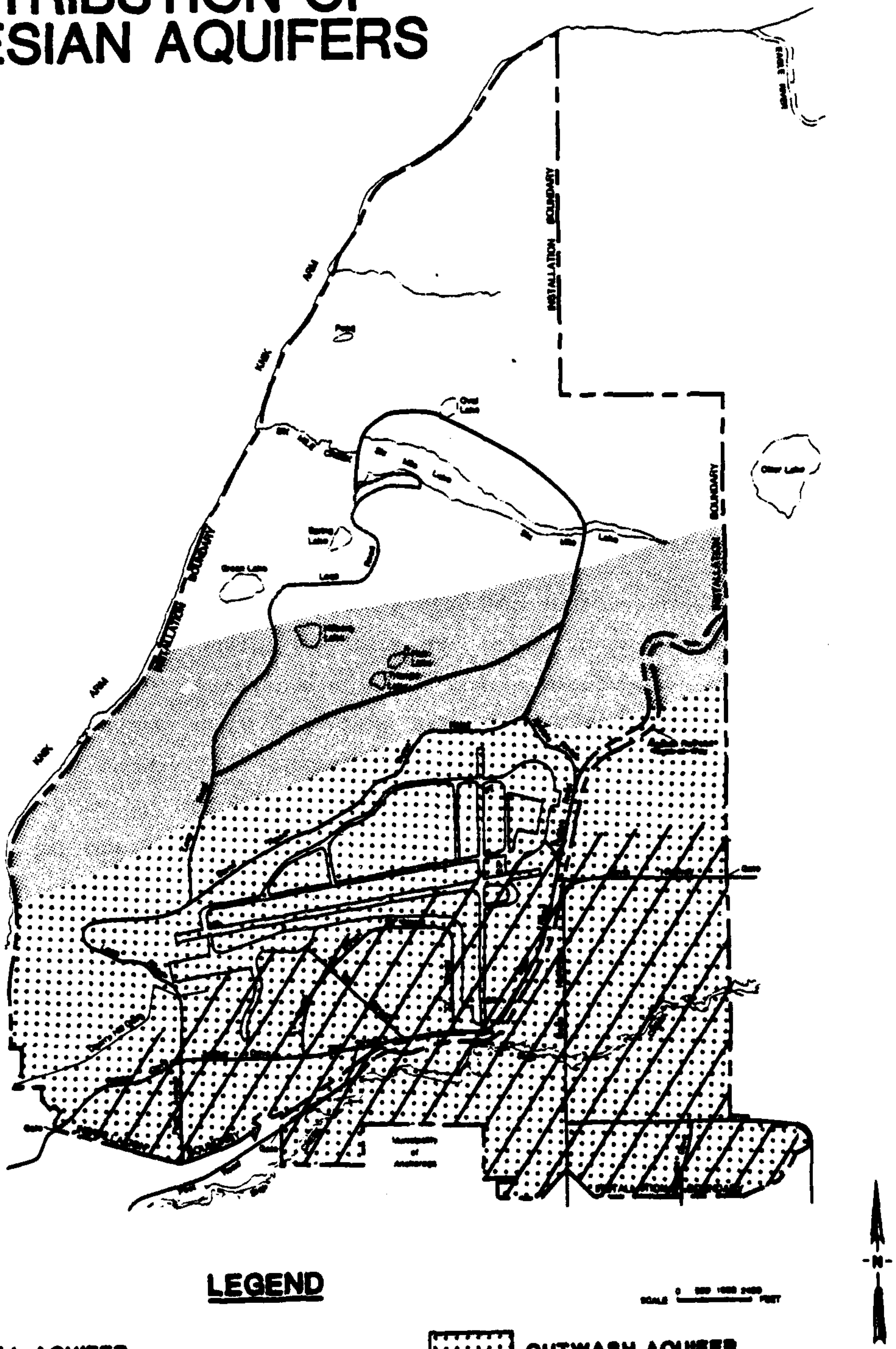
Figure 3.14 shows that the outwash sands and gravels that form the most prolific unit occur along the southern extent of Elmendorf AFB. This is the most dependable source of large quantities of water supplies and it is into this unit that most municipal water system wells are constructed. The least productive unit is the till common to the installation uplands. In some local cases, water in the till may be partially confined. Although an entire sequence of till may be saturated, normally only local lenses of sand or sand and gravel buried within the till yield water to wells in adequate quantities. The unit is therefore considered serviceable to small quantity consumers such as individual homes or remote military facilities not connected to a centralized distribution system.

Ground-water levels and flow (1969 data) within the artesian system are shown on Figure 3.15, which has been modified from Barnwell, et. al., 1971. Ground-water flow proceeds in a westerly direction toward Knik Arm with respect to Elmendorf AFB. Major pumping centers active in 1969 are also depicted. Based upon the data presented in Figure 3.15, the artesian system hydraulic gradient is interpolated to be twenty-five feet per mile at the base.

FIGURE 3.14

ELMENDORF AFB

DISTRIBUTION OF ARTESIAN AQUIFERS



LEGEND

TILL AQUIFER

NO DATA AVAILABLE

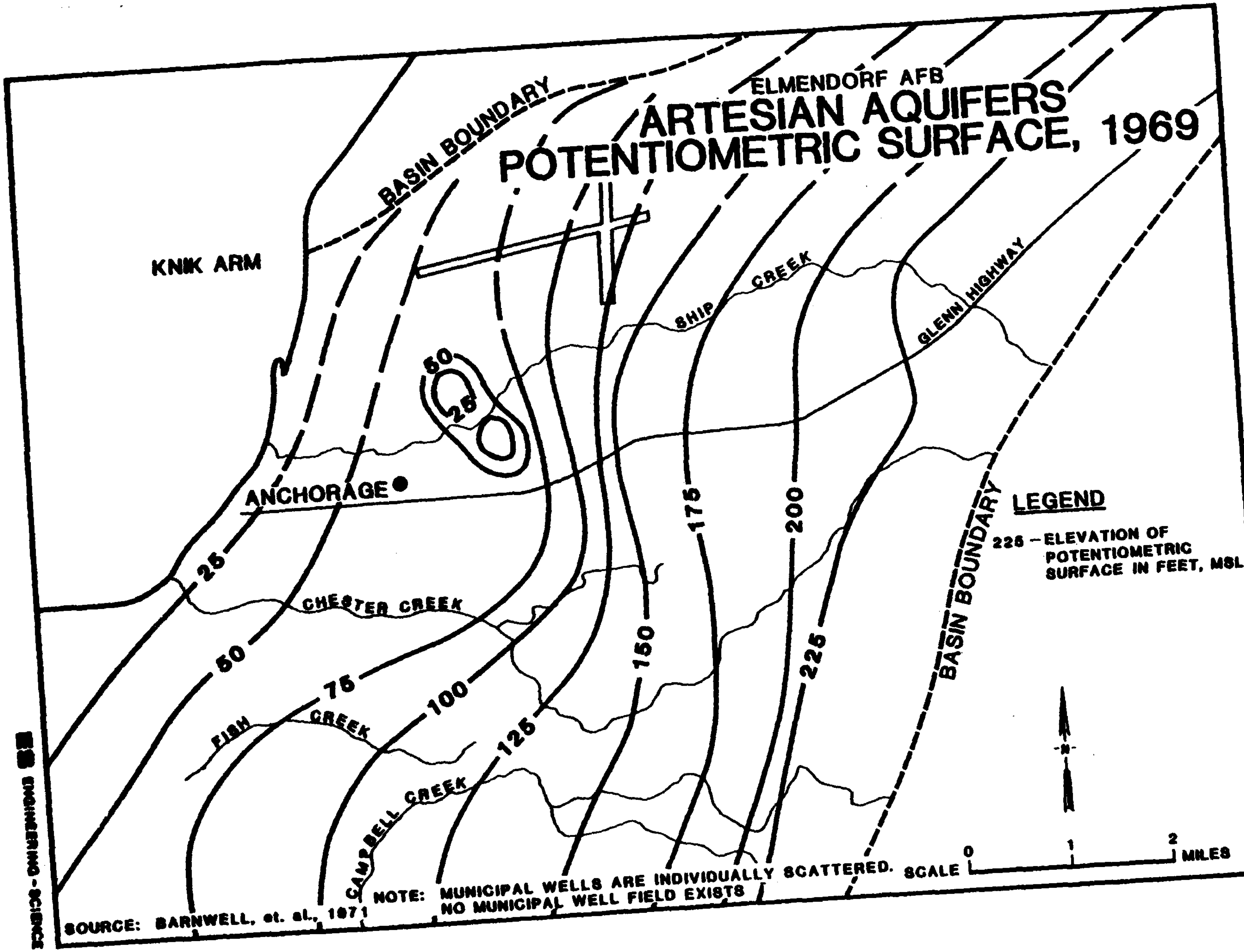
OUTWASH AQUIFER

ALLUVIAL AQUIFER

SOURCE: SELKREGG, ET. AL., 1972

ES ENGINEERING-SCIENCE

FIGURE 3.15



ES ENGINEERING-SCIENCE

Data published by Cederstrom, et. al., (1964); Barnwell, et. al., (1971) and Selkregg, et. al., (1972) indicate that the quality of water obtained from the artesian system is good. Nelson (1982), published a detailed study of a shallow aquifer ground-water contamination problem relative to the Merrill Field municipal landfill, located south of Elmendorf AFB. He determined that while the landfill had produced leachate contaminating the shallow aquifer, the artesian system was, at present, a safe source of good quality water supplies.

Subsurface Contaminant Migration

An inspection of installation geology, Figure 3.4, indicates that most base geologic units are permeable at ground surface. In many cases, the permeable nature of base geologic units extends downward to the water levels present within shallow aquifer units. This is especially true where alluvial fan and outwash aquifers exist along the southern portion of the installation property (refer to Figure 3.9). Contaminants entering these highly permeable zones would likely stratify. Discharge to Ship Creek would be expected.

Contaminants such as fuels leaking from facilities located on/in Elmendorf Moraine would be expected to migrate vertically to the local water table and then be transported laterally out of the system. A portion of the migrating POL would bond to soil particles. Petroleum products tend to persist in the environment and migrate at a rate substantially less than typical ground-water flow rates (Davis, et. al., 1972). Therefore, contaminant flow rates cannot be estimated, based on advection without consideration of retardation factors. Fuels encountering clays, tills or other confining strata before reaching the water table would reasonably be expected to continue lateral migration until sufficiently large enough quantities of the contaminant have become bound to soil particles. At this point, a condition known as "exhaustion to immobility" occurs - the contaminant is present, but no longer mobile. Subsequent rainfall, however, will remobilize the migrating POL. Intervening dry periods would be expected to slow the migration process considerably.

The lateral migration of petroleum products along (presumably) the upper Bootlegger Cove Clay at Elmendorf AFB was observed at the base of the Elmendorf Moraine along Burns Road. Road shoulders and the low area north of the main instrument runway were saturated with JP-4. POL migration is presently occurring along a southward trend from the subsurface fuel storage tanks constructed in the moraine towards the main installation area.

Base Water Supplies

Elmendorf AFB receives most of its water supplies from Ship Creek via the diversion structure at Fort Richardson. Additional supplies may be obtained as needed from standby wells. Facilities not connected to the base central water distribution system derive water supplies from individual wells. Twenty-one active base wells are listed on Table 3.3. Twenty-three presently inactive or abandoned wells are tabulated on Table 3.4. The locations of all base wells are shown on Figure 3.16. Most of the active base wells have been installed into the artesian system, where plentiful supplies of good quality are available. Many of the deep wells penetrate several water bearing zones. This is true of base well number 2 (USGS number 28), the log of which is presented as Figure 3.17. It is noted that this well penetrated a confining layer some 150 feet thick (clay layer between 58 and 208 feet below land surface) which effectively separates shallow and artesian aquifers at the well location.

Off-base Wells

The only major water supply wells of consequence located beyond installation boundaries are those operated by the Anchorage Water and Wastewater Utility. The municipal well locations are depicted on Figure 3.18. Their present status (as of 18 May 1983) is as follows:

Well Number	Condition
1	Out of service
2	Out of service
3	Out of service
4	In continuous service
9	In continuous service

No records were available to determine the location and utilization of small diameter, low-capacity wells constructed in shallow aquifers that may exist near installation boundaries.

TABLE 3.3
WELLS IN USE

Well	Building	Depth	Aquifer	GPM	GPM Drill Test	Location
1	23-990	16'	S	1350	1125	South of N.S. Runway
2	22-001	850'	A	840	1437	South of West Power Plant
4	65-600	78'	S	7	7	Returnagain, Six Mile Lake
8	52-140	252'	A	12	12	EMS Office Loop Road
16	32-189	228'	A	95	85	Standby Diesel Plant
24	52-668	38'	S	8	16	Generals Cabin Green Lake
25	63-320	155'	A	9	20	Underground Six Mile Lake
27	62-250	210'	A	12	12	Receiver Site
29	42-500	406'	A	40	40	C.A.P.
39	35-750	141'	A	115	270	Transmitter Ft. Richardson
40	5-800	209'	A	228	310	AAC 5-800
41	52-820	56'	S	12	12	Hillberg Lake Ski Bowl
42	11-200	225'	A	139	300	DAC Building
43	24-800	159'	A	54	250	USAF Hospital
46	63-621	60'	S	10	10	Chalet MAC Six Mile Lake
47	63-740	23'	S	16	16	CE Shady Lane Six Mile Lake
49	52-560	130'6"	A	16	16	Green Lake Rec Area
50	BLM	-	-	-	42	Oil Well Road
51	63-501	-	-	-	-	6981st Rec Area Six Mile Lake
52	23-100	166'	A	36	50	Golf Course Pro Shop
53	62-145	125'	A	8	8	EMS Ammo Storage Six Mile Lake

Note: Aquifer Codes: S-Shallow; A-Artesian
Source: Installation Documents, 1983

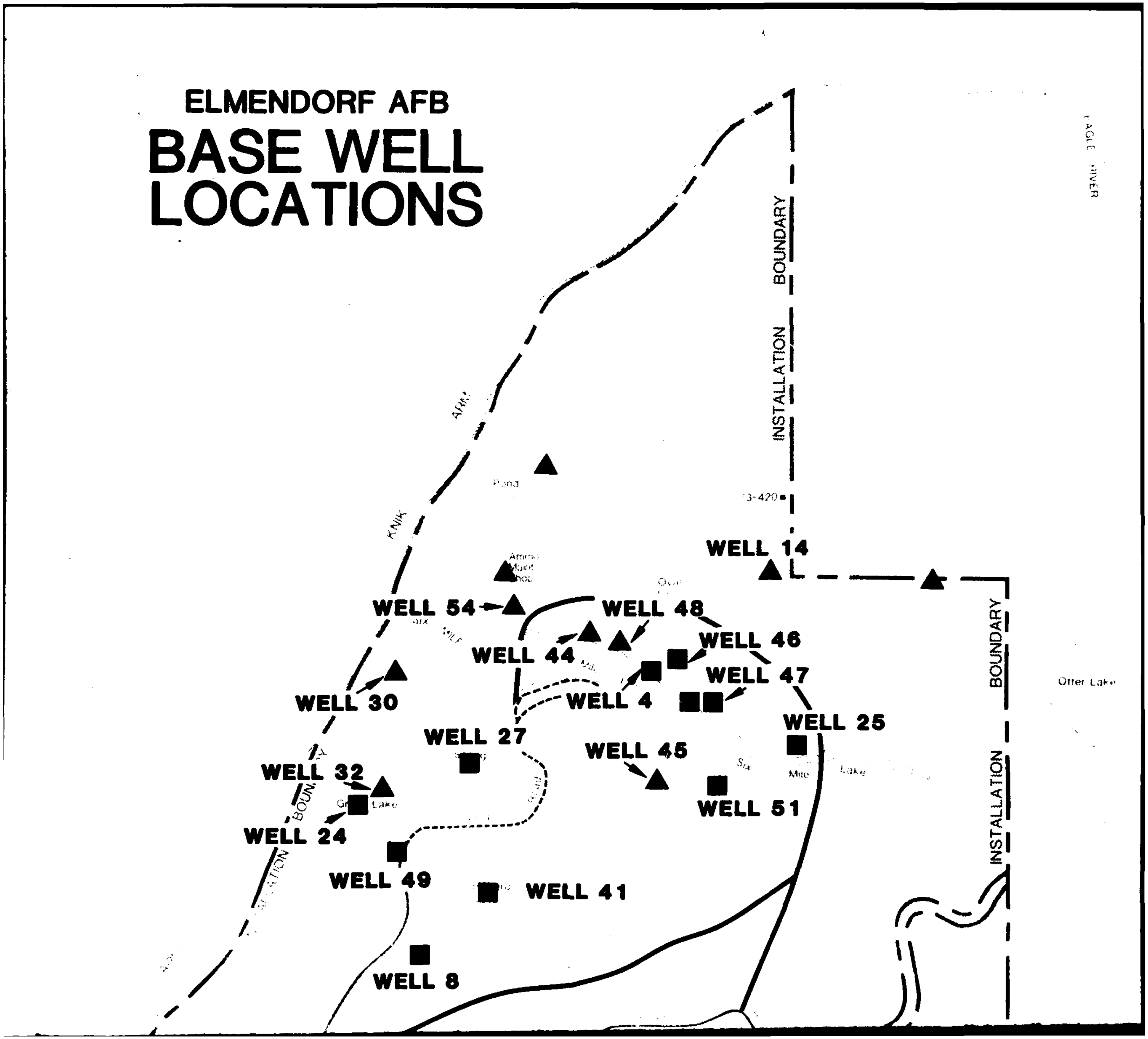
TABLE 3.4
INACTIVE AND ABANDONED WELLS

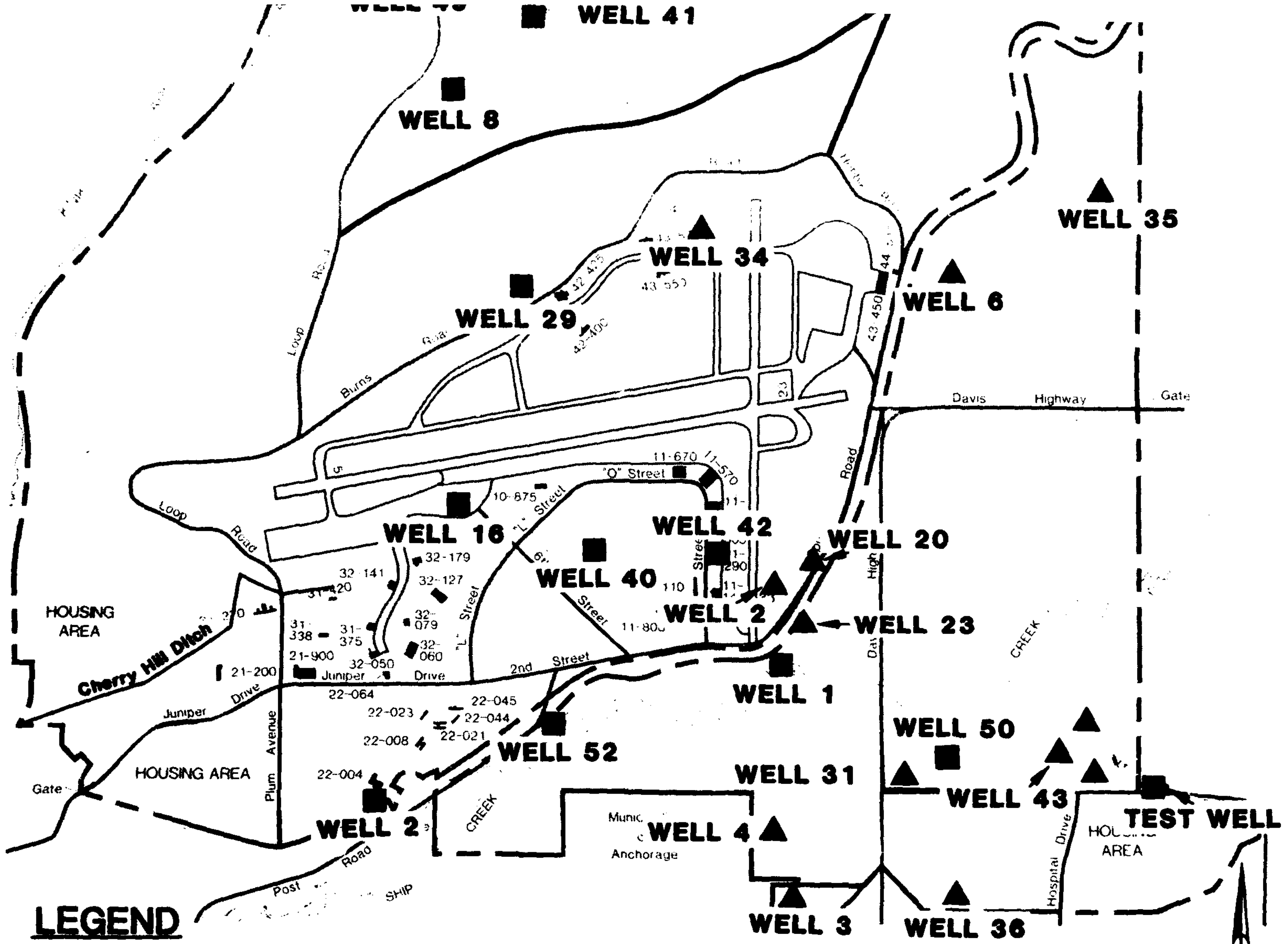
Well	Building	Depth	Aquifer	GPM	Condition	GPM Drill Test	Location
23	33-358	71'	S	36	Capped	36	Riding Stables
32	52-725	246'	A	12	"	12	Gun Site #1
34	53-125	186'	A	12	"	12	Gun Site #10
45	63-552	40'	S	50	"	50	Ranch Six Mile Lake
48	63-612	109'6"	A	30	"	55	Field Maint. Six Mile Lake
54	62-140	-	-	-	"	-	EMS Six Mile Lake
2 OLD	33-000	78'	S	30	"	75	Old Round House
3	23-400	153'	A	104	"	104	Artesion Village South
6	44-544	314'	A	40	"	80	Old 625 Radar
30	62-700	142'	A	18	"	18	Fish Camp D Battery
31	24-500	158'	A	60	"	60	BLM Old C Battery
N.N.	64-560	-	-	-	"	-	-
35	44-705	405'	A	12	"	12	Site #3
36	24-025	189'	A	12	"	12	Site #5
4 OLD	23-396	45'	S	35	Abandoned	35	Artesion Village North
14	73-400	60'	S	12	"	35	Old AFSC Receiver Site
20	52-812	70'	S	9	"	25	Hillberg Lake (Resident)
N.N.	-	202'	A	12	"	12	Site #6
N.N.	-	189'	A	12	"	12	Site #2
44	63-615	87'	S	20	"	20	Six Mile Lake 21st Trans

Note: (1)Aquifer Codes--S:Shallow; A:Artesian
(2)Three (3) Wells on Hospital Line.
1. 1000 GPM 2. 1000 GPM 3. 800 GPM
(3)N.N. - No Number

Source: Installation Documents, 1983

ELMENDORF AFB
BASE WELL LOCATIONS





LEGEND

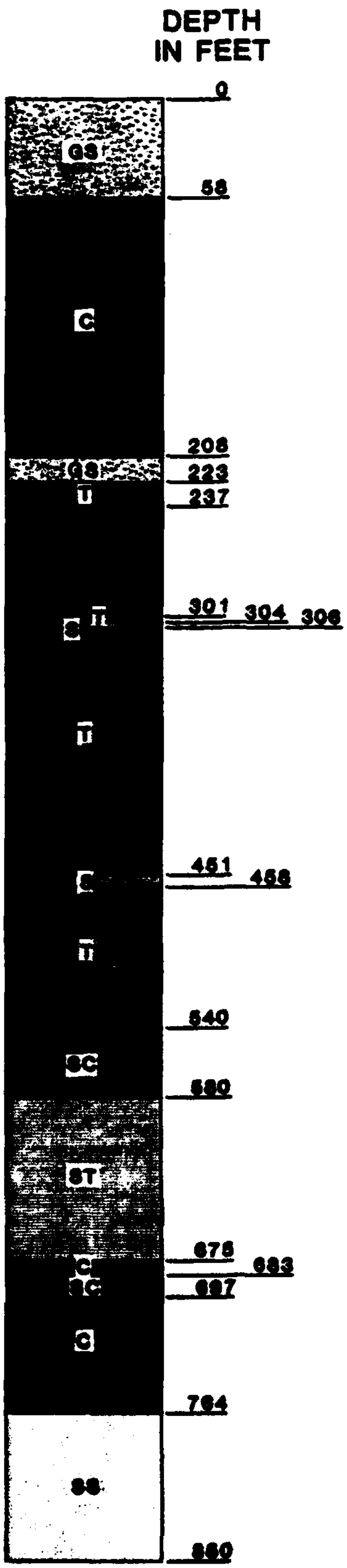
■ ACTIVE WELLS

▲ INACTIVE OR ABANDONED WELLS

NOTE: SOME WELLS WERE NOT ASSIGNED NUMBERS

SOURCE: ELMENDORF AFB INSTALLATION DOCUMENTS

FIGURE 3.17



ELMENDORF AFB

LOG OF BASE WELL NO. 2 (USGS NO. 28)

(Well Located at Building 22-001)

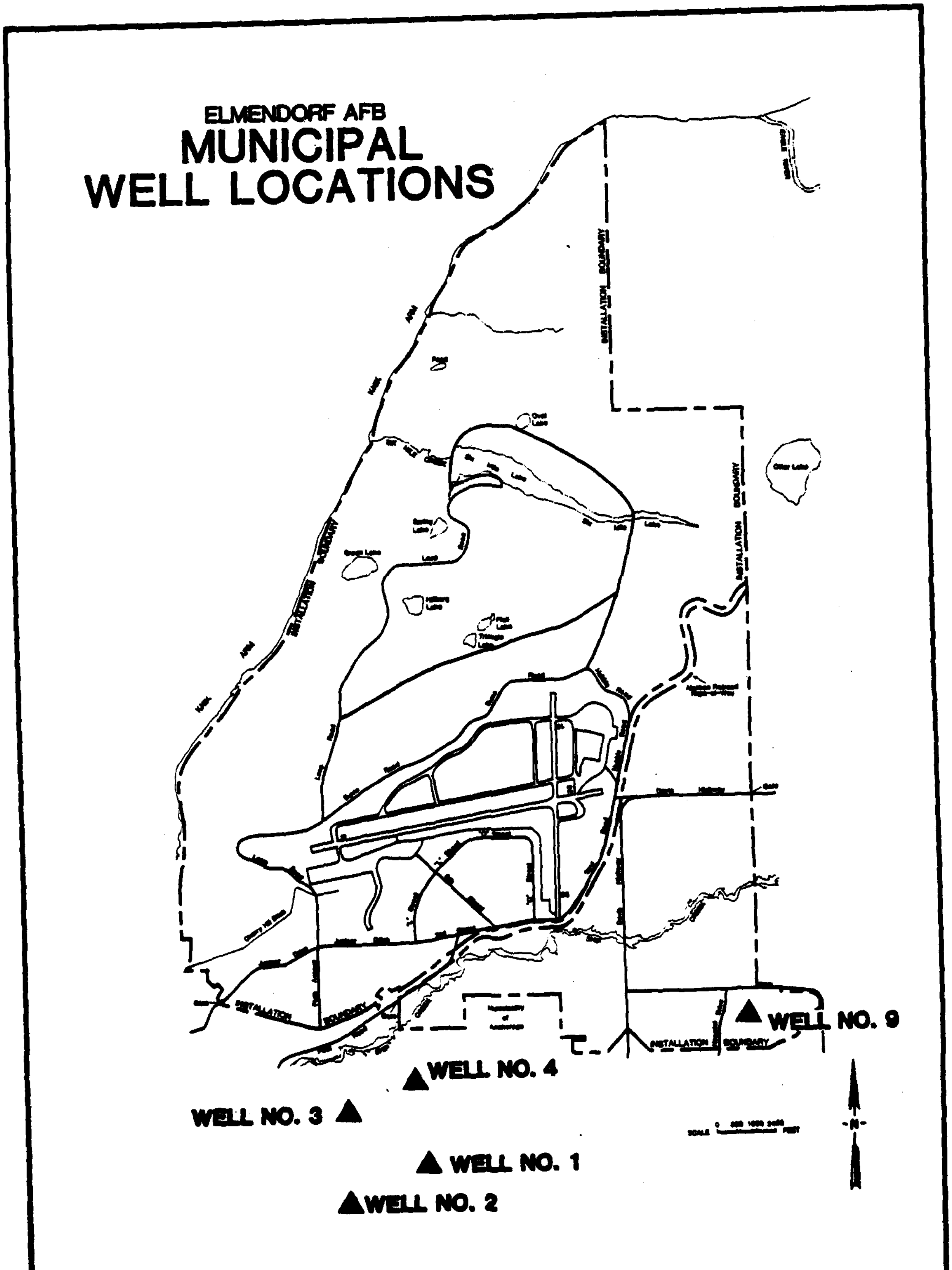
LEGEND

- GS GRAVELLY SANDY/SANDY GRAVEL
- SC SILT AND CLAY
- S SAND
- C CLAY
- T TILL
- SS SANDSTONE, SHALE (BEDROCK OF KENAI FORMATION)
- ST SILT

NOTE: WELL SCREEN LEVEL NOT INCLUDED IN SOURCE

SOURCE: CEDERSTROM, et. al., 1964

FIGURE 3.18



SOURCE: ANCHORAGE WATER AND WASTEWATER UTILITY, 1983

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Water deived from artesion municipal wells is reported to be excellent (Sundquist, 1983).

SURFACE WATER QUALITY

Surface water quality sampling is conducted by the Bioenvironmental Engineering Services on a routine basis at six on-base locations for 20 parameters. The surface water sampling locations are shown on Figure 3.19 and are summarized as follows:

Sample Point Number	Description
NS 101	Cherry Hill Ditch
NS 102	Sewage Lagoon
NA 103	Sixmile Lake at Dam
NA 104	Ship Creek at Fort Richardson Boundary
NA 105	Ship Creek at Point of Exit from Base
NS 106	Government Hill Manhole

Historically, the sewage lagoon has produced coliform-contaminated samples. Government Hill and Ship Creek Samples have been generally of good quality, however, occasionally iron concentrations appear elevated.

THREATENED OR ENDANGERED SPECIES

Elmendorf AFB provides habitat to a wide variety of birds and small game. A permanent herd of 35 to 40 moose (Alces Americanus) is in residence. Black bear are indigenous. Brown bear are transients.

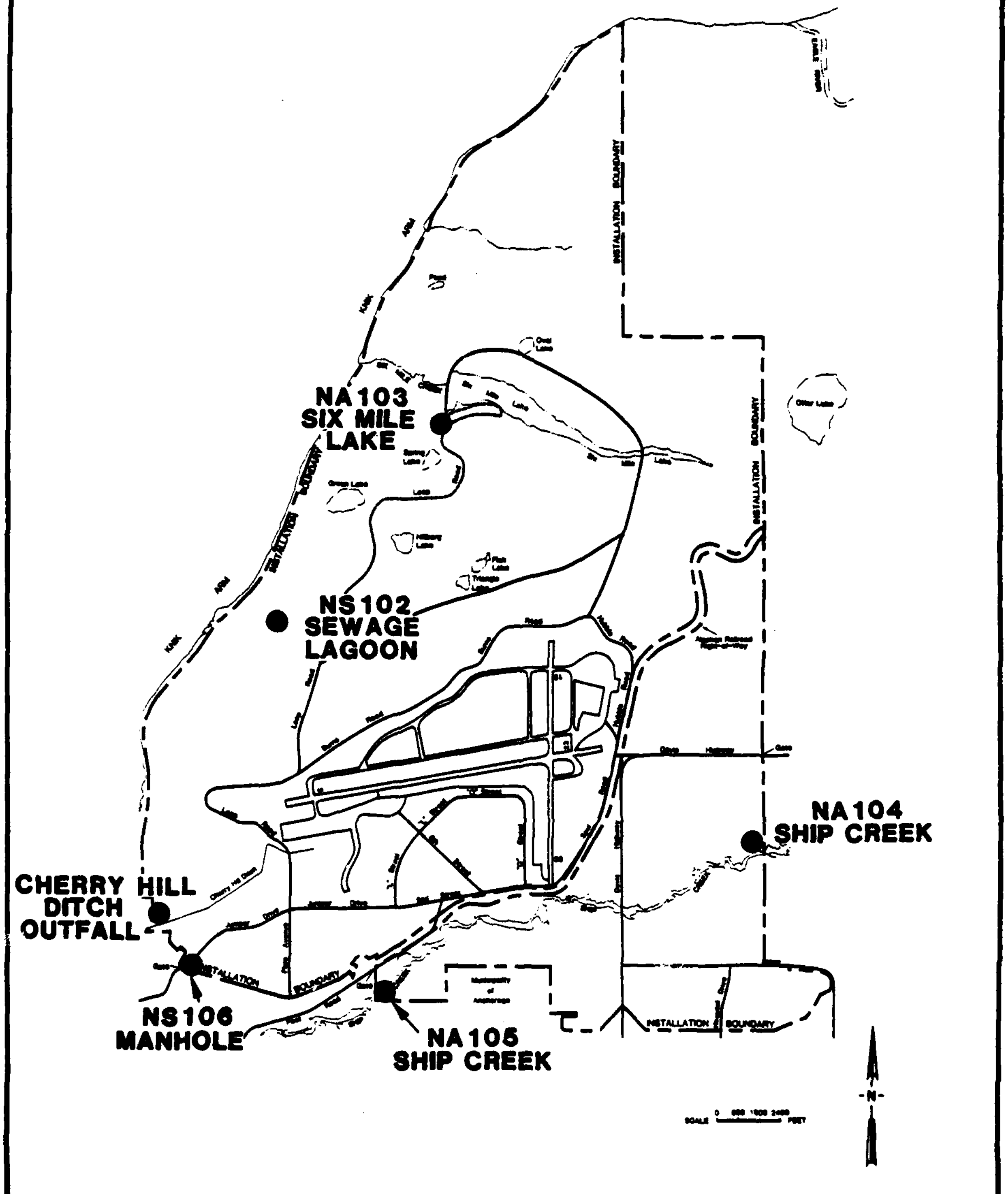
There are no threatened or endangered species in the Elmendorf AFB area. These conclusions are based on the installation Tab A-1 Report, (1977) and Bureau of Land Management (1979).

A biological inventory is presently in progress at Elmendorf AFB by U.S. Fish and Wildlife Service Personnel. This study will be available by the end of calendar year 1983, and should provide definitive information relative to biota at Elmendorf.

FIGURE 3.19

ELMENDORF AFB

BASE SURFACE WATER SAMPLING LOCATIONS



SOURCE: ELMENDORF AFB INSTALLATION DOCUMENTS

ES ENGINEERING-SCIENCE

SUMMARY OF ENVIRONMENTAL SETTING

The environmental setting data reviewed for this investigation indicate that the following major items are relevant to the evaluation of past hazardous waste disposal practices at Elmendorf AFB:

- Installation mean annual precipitation is 15.5 inches. The total amount of water available for infiltration is estimated to be in the range of five to nine inches or about thirty to fifty percent of the mean annual precipitation.
- Flooding is not normally a problem on Elmendorf AFB.
- Installation surface soils are typically granular glacial deposits exhibiting moderate to high permeabilities.
- The shallow aquifer system is present at or near ground surface at the installation and is intimately related to the local surface waters (Ship Creek at the base). The depth to the water table varies from five to fifty feet below land surface.
- The regional aquifer (artesian system) is present at depths of approximately one hundred feet below installation land surface. The artesian system is separated from the shallow aquifer system by substantial thicknesses of confining materials (identified as the Bootlegger Cove Clay in some reports). The actual confining layer(s) may be several separate strata.
- The shallow aquifer has been contaminated at the municipal landfill and at other locations in the City of Anchorage.
- No evidence of ground-water contamination was reported for Elmendorf AFB disposal facilities.
- The surface waters entering and exiting the base are considered to be of good quality.
- No threatened or endangered species have been observed within installation boundaries.

From these major points, it may be seen that there are potential pathways for the migration of hazardous waste-related contamination to the shallow aquifer. If hazardous materials are present at ground surface, they may be transported a short vertical distance to a local shallow aquifer. Contaminants entering south installation shallow aquifers will most likely be discharged in base flow to Ship Creek,or Cherry Hill Ditch. Water entering north installation shallow aquifers will probably be discharged to area wetlands or local surface waters. Contaminant migration to the deep aquifer system is considered to be remote.

SECTION 4

FINDINGS

To assess hazardous waste management at Elmendorf Air Force Base, past activities of waste generation and disposal methods were reviewed. This section summarizes the hazardous waste generated by activity; describes past waste disposal methods; identifies the disposal sites located on the base; and evaluates the potential for environmental contamination.

PAST SHOP AND BASE ACTIVITY REVIEW

To identify past base activities that resulted in generation and disposal of hazardous waste, a review was conducted of current and past waste generation and disposal methods. This activity consisted of a review of files and records, interviews with base current and former employees, and site inspections.

The source of most hazardous wastes on Elmendorf AFB can be associated with one of the following activities:

- o Industrial operations (shops)
- o Fire training
- o Fuels management

The following discussion addresses only those wastes generated on Elmendorf AFB which are either hazardous or potentially hazardous. In this discussion a hazardous waste is defined as hazardous by the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA). A potentially hazardous waste is one which is suspected of being hazardous, although insufficient data are available to fully characterize the waste material.

Industrial Operations (Shops)(IS)

Industrial operations at Elmendorf AFB consist primarily of aircraft and vehicle maintenance and repair activities. These and other mission support operations generate potentially hazardous materials at a number of industrial shops. The Bioenvironmental Engineering (BEE) Office provided a listing of industrial shops which was used as a basis for evaluating past waste generation and hazardous material disposal practices. The BEE individual shop files were also examined for information on hazardous material usage, and hazardous waste generation and disposal practices. From this information, a master list of industrial shops (Appendix D) was prepared showing building locations, hazardous materials handlers, hazardous waste generators, and typical treatment, storage, and disposal methods. Additionally, documents prepared by the base Civil Engineering Squadron and the USAF Occupational and Environmental Health Laboratory were reviewed to develop further information on the shops located at Elmendorf AFB.

Those shops which were determined to be generators of hazardous wastes which could pose a potential for ground-water or surface water contamination were selected for further investigation and evaluation. During the site visit, interviews were conducted with personnel from many of these industrial shops, including the shops that generate the largest amounts of hazardous wastes. Additional shops generating lesser amounts of hazardous wastes were contacted by telephone. Shop interviews focused on hazardous waste materials, waste quantities, and disposal methods. Disposal timelines were prepared for each major hazardous waste from information provided by shop records, shop personnel and others familiar with the shop's operations and activities.

Table 4.1 summarizes the information obtained from the detailed shop review. The table includes a listing of the types of hazardous wastes generated at the various shops, waste quantities and disposal methods. Table 4.1 does not include the shops which generate insignificant quantities of hazardous waste. Many of the shops which were reviewed during the study were previously located in one of several different facilities throughout the base. In most cases, the shops belonged to various tenant and host organizations. The shop relocations

TABLE 4.1

INDUSTRIAL OPERATIONS (Shops)

Waste Management

SHOP NAME	LOCATION (BLDG. NO.) PRESENT	LOCATION (BLDG. NO.) PAST	WASTE MATERIAL	WASTE QUANTITY	METHOD(S) OF TREATMENT, STORAGE & DISPOSAL 1940 – 1950 – 1960 – 1970 – 1980
21st EQUIPMENT MAINTENANCE SQUADRON					
AEROSPACE GROUND EQUIPMENT	32-079 32-127 11-290	11-130	TURBINE OIL	600 GALS./YR.	(b) 68 (a) 79 DPDO
			HYDRAULIC FLUID	900 GALS./YR.	(b) (a) DPDO
			JP-4 AND MOGAS	1500 GALS./YR.	(b) (a) DPDO
			PD-680	600 GALS./YR.	(b) (a) DPDO
AEROSPACE GROUND EQUIPMENT DISPATCH SECTION	43-410		PAINT RESIDUE	<55 GALS./YR.	STORM DRAINS AND DISPOSAL WITH GENERAL REFUSE; TO CORROSION CONTROL SHOP
			PD-680	55 GALS./MO.	FLOOR DRAINS TO DRY WELL DPDO
FUEL CELL REPAIR	43-450	32-129	JP-4	1200-1500 GALS./YR.	FIRE TRAINING/ CONTRACTOR 77 DPDO
		42-400	PD-680	55 GALS./YR.	FLOOR DRAINS TO DRY WELL/ FIRE TRAINING/CONTRACTOR DPDO
REPAIR AND RECLAIMATION	11-470		HYDRAULIC FLUID JP-4	10 GALS./MO.	(b) 68 (a)/STORM DRAINS 79 STORM DRAINS/ DPDO
TIRE SHOP	11-670	11-570	PD-680	100 GALS./MO.	FIRE TRAINING 58 (a)/STORM DRAINS STORM DRAINS/ DPDO
CORROSION CONTROL	32-050	42-400	PAINT RESIDUES STRIPPER	55 GALS./MO.	STORM DRAIN, SOME BURNED AT FIRE TRAINING DPDO
			MEK	55 GALS./MO.	STORM DRAIN, SOME BURNED AT FIRE TRAINING DPDO

KEY

——— CONFIRMED TIME FRAME DATA BY SHOP PERSONNEL

- - - - - - ESTIMATED TIME FRAME DATA BY SHOP PERSONNEL

NOTES

(a) STORAGE IN U/G TANK ADJACENT TO OLD POWER PLANT (11-433) SOME MATERIAL REMOVED BY OFF-BASE CONTRACTOR

(b) TO SURFACE DRAINAGE, PAVEMENTS AND GROUNDS FOR ROAD DUST CONTROL, FIRE TRAINING OR SALVAGE FOR CONTRACTOR DISPOSAL

TABLE 4.1 (Cont'd)

INDUSTRIAL OPERATIONS (Shops)

Waste Management

SHOP NAME	LOCATION (BLDG. NO.) PRESENT	LOCATION (BLDG. NO.) PAST	WASTE MATERIAL	WASTE QUANTITY	METHOD(S) OF TREATMENT, STORAGE & DISPOSAL (1940 – 1950 – 1960 – 1970 – 1980)
21st COMPONENT REPAIR SQUADRON					
AIR CREW TRAINING DEVICES	11-750		HYDRAULIC FLUID	165 GALS./2 YRS.	65 (a) 79 DPDO
PRECISION MEASUREMENT INSTRUMENT LAB (PMEL)	22-064		MERCURY	<1 PT. /YR.	67 OGDEN AIR LOGISTICS CENTER DPDO
			MERCURY CONTAMINATED SOLVENTS	<1 GAL./YR.	(a) 81 DPDO
PROPULSION SHOP	11-110 11-130		JP-4	55 GALS./MO.	68 (a) 80 DPDO
			ENGINE OIL	55 GALS./MO.	(a) DPDO
METAL PROCESSING	31-420	32-130	NICKEL PLATING SOLUTION CHROME PLATING SOLUTION COPPER PLATING SOLUTION	300-750 GAL. TANKS IRREGULAR DISPOSAL	STORM DRAINS 57 DITCH ADJACENT TO BLDG. 31-420 TANK SPILLED DURING EARTHQUAKE 64 NEUTRALIZED AND BURIED IN DRUMS 72 CONTRACTOR DISPOSAL 80 DPDO
			CAUSTIC	250 GALS./3 MOS.	STORM SEWER
			CLEANING SOLVENTS	<100 GALS./IRREGULAR DISPOSAL	STORM DRAINS 57 DITCH ADJACENT TO BLDG. 31-420 64 STORM SEWER 80 DPDO
NONDESTRUCTIVE INSPECTION LAB (NDI)	11-570		PENETRANT	55 GALS./6 MOS.	68 (a)/STORM DRAINS 79 STORM DRAINS/DPDO
			EMULSIFIER	55 GALS./6 MOS.	(a)/STORM DRAINS STORM DRAINS/DPDO
			DEVELOPER	55 GALS./6 MOS.	(a)/STORM DRAINS STORM DRAINS/DPDO
			PD-680	30 GALS./6 MOS.	(a)/STORM DRAINS STORM DRAINS/DPDO
TIP TANK FARM			JP-4		81 DPDO

KEY

———— CONFIRMED TIME FRAME DATA BY SHOP PERSONNEL

- - - - - - ESTIMATED TIME FRAME DATA BY SHOP PERSONNEL

NOTES

(a) STORAGE IN U/G TANK ADJACENT TO OLD POWER PLANT (11-433) SOME MATERIAL REMOVED BY OFF-BASE CONTRACTOR

(b) TO SURFACE DRAINAGE, PAVEMENTS AND GROUNDS FOR ROAD DUST CONTROL, FIRE TRAINING OR SALVAGE FOR CONTRACTOR DISPOSAL

TABLE 4.1 (Cont'd)

INDUSTRIAL OPERATIONS (Shops)

Waste Management

SHOP NAME	LOCATION (BLDG. NO.) PRESENT	LOCATION (BLDG. NO.) PAST	WASTE MATERIAL	WASTE QUANTITY	METHOD(S) OF TREATMENT, STORAGE & DISPOSAL 1940 1950 1960 1970 1980
21st COMPONENT REPAIR SQUADRON (Cont'd.)					
PNEUDRAULICS	11-570		PD-680	600 GALS./YR.	(b) (a) 79 DPDO
			HYDRAULIC FLUID	200 GALS./YR.	(b) (a) DPDO
BATTERY SHOP	32-129		CONDEMNED BATTERIES	27,000 LBS./YR. (AVERAGE)	TO LANDFILLS 68 DPDO
ELECTRIC SHOP	11-470		ENGINE OIL	200 GALS./YR.	(b) 68 (a) 79 DPDO
			PD-680	100 GALS./YR.	(b) (a) DPDO
21st AIRCRAFT GENERATION SQUADRON					
21st AIRCRAFT MAINTENANCE UNIT (AMU)	11-670		JP-4	100 GALS./MO.	78 DPDO
43rd AIRCRAFT MAINTENANCE UNIT (AMU)	11-355		ENGINE OIL	10 GALS./WK.	70 (a) 79 DPDO
			HYDRAULIC FLUID	10 GALS./WK.	(a) DPDO
			JP-4	10 GALS./WK.	DPDO

KEY

——— CONFIRMED TIME FRAME DATA BY SHOP PERSONNEL

- - - - - ESTIMATED TIME FRAME DATA BY SHOP PERSONNEL

NOTES

(a) STORAGE IN U/G TANK ADJACENT TO OLD POWER PLANT (11-433) SOME MATERIAL REMOVED BY OFF-BASE CONTRACTOR

(b) TO SURFACE DRAINAGE, PAVEMENTS AND GROUNDS FOR ROAD DUST CONTROL, FIRE TRAINING OR SALVAGE FOR CONTRACTOR DISPOSAL

TABLE 4.1 (Cont'd)

INDUSTRIAL OPERATIONS (Shops)

Waste Management

SHOP NAME	LOCATION (BLDG. NO.) PRESENT	LOCATION (BLDG. NO.) PAST	WASTE MATERIAL	WASTE QUANTITY	METHOD(S) OF TREATMENT, STORAGE & DISPOSAL (1940 – 1980)
21st SUPPLY SQUADRON					
FUELS LAB	32-069		JP-4	30 GALS./MO.	RECYCLED OR DPDO
21st CIVIL ENGINEERING SQUADRON					
ENTOMOLOGY SHOP	22-021		PESTICIDES, HERBICIDES	SMALL QUANTITY	DPDO
PAINT SHOP	22-045		WASTE SOLVENTS AND PAINTS	<25 GALS./MO.	STORM DRAINS, SOME BURNED FIRE TRAINING; 68 DPDO
			DILUTED WASTE THINNERS FROM STRIPPING TRUCK	300 GALS./YR.	TO LANDFILL; 74 DPDO
POWER PLANT	22-004	11-433, 32-189, 31-320, 21-878, 9-154	LUBE OILS AND DIESEL FUEL	500 GALS./YR. (MIXED)	DISPERSED IN DITCHES AND GROUND ADJACENT TO BLDGS.; 68 (a); 80 DPDO
			MISCELLANEOUS CLEANING SOLVENT	50 GALS./YR. (MIXED)	
			BOILER BLOWDOWN	<50 GALS./YR.	72 SANITARY SEWER
DIESEL BARRIER MAINTENANCE	22-039		HYDRAULIC FLUID	10 GALS./YR.	(b); 79 DPDO
			LUBE OIL	10 GALS./YR.	
			DIESEL FUEL	20 GALS./YR.	

KEY

——— CONFIRMED TIME FRAME DATA BY SHOP PERSONNEL

- - - - ESTIMATED TIME FRAME DATA BY SHOP PERSONNEL

NOTES

(a) STORAGE IN U/G TANK ADJACENT TO OLD POWER PLANT (11-433) SOME MATERIAL REMOVED BY OFF-BASE CONTRACTOR

(b) TO SURFACE DRAINAGE, PAVEMENTS AND GROUNDS FOR ROAD DUST CONTROL, FIRE TRAINING OF SALVAGE FOR CONTRACTOR DISPOSAL

TABLE 4.1 (Cont'd)

INDUSTRIAL OPERATIONS (Shops)

Waste Management

SHOP NAME	LOCATION (BLDG. NO.) PRESENT	LOCATION (BLDG. NO.) PAST	WASTE MATERIAL	WASTE QUANTITY	METHOD(S) OF TREATMENT, STORAGE & DISPOSAL 1940 – 1950 – 1960 – 1970 – 1980
21st TRANSPORTATION SQUADRON					
REFUELING MAINTENANCE	31-338	43-410 11-290	ENGINE OIL HYDRAULIC FLUID	30 GALS./MO.	(b) - - - 67 (a) 79 DPDO
			JP-4	200 GALS./MO.	RECYCLED OR DPDO
VEHICLE MAINTENANCE	21-900	11-110	ENGINE OIL HYDRAULIC FLUID	4,500 GALS./YR.	STORM DRAINS TO LEACH FIELD, CONTRACTOR, BASE ROADS FOR DUST CONTROL 79 DPDO
			PD-680	1,200 GALS./YR.	STORM DRAINS TO LEACH FIELD, CONTRACTOR, BASE ROADS FOR DUST CONTROL DPDO
HEAVY EQUIPMENT SHOP	32-141		ENGINE OIL	250 GALS./MO.	SALVAGE, STORM DRAINS AND FIRE TRAINING 67 DPDO
			CLEANING SOLVENT (PD-680)	120 GALS./MO.	SALVAGE, STORM DRAINS AND FIRE TRAINING DPDO
CRASH FIRE EQUIPMENT SHOP	10-875	21-900	PD-680	20 GALS./3 MOS.	CONTRACTOR 73 DPDO
			HYDRAULIC FLUID ENGINE OIL	150 GALS./MO.	CONTRACTOR 73 DPDO
21st COMBAT SUPPORT GROUP					
AUTO HOBBY SHOP	21-200		WASTE OILS CLEANING SOLVENTS	200 GALS./MO.	SERVICE CONTRACTOR 79 DPDO

KEY

——— CONFIRMED TIME FRAME DATA BY SHOP PERSONNEL

- - - - - - ESTIMATED TIME FRAME DATA BY SHOP PERSONNEL

NOTES

(a) STORAGE IN U/G TANK ADJACENT TO OLD POWER PLANT (11-433) SOME MATERIAL REMOVED BY OFF-BASE CONTRACTOR

(b) TO SURFACE DRAINAGE, PAVEMENTS AND GROUNDS FOR ROAD DUST CONTROL, FIRE TRAINING OF SALVAGE FOR CONTRACTOR DISPOSAL

TABLE 4.1 (Cont'd)

INDUSTRIAL OPERATIONS (Shops)

Waste Management

SHOP NAME	LOCATION (BLDG. NO.) PRESENT	PAST	WASTE MATERIAL	WASTE QUANTITY	METHOD(S) OF TREATMENT, STORAGE & DISPOSAL 1940 1950 1960 1970 1980
21st COMBAT SUPPORT GROUP (Cont'd)					
AERO CLUB	32-209	11-140	WASTE OILS	120 GALS /MO.	(b) (a) DPDO CONTRACTOR
			WASTE FUELS	VARIABLE	TO PRIVATE VEHICLES
1931st COMMUNICATIONS GROUP					
METEOROLOGICAL EQUIPMENT MAINTENANCE	31-270		MERCURY	<1 GAL./YR.	DPDO
616th CONSOLIDATED AIRCRAFT MAINTENANCE SQUADRON					
AIRCRAFT GROUND EQUIPMENT (AGE)	42-425		HYDRAULIC FLUID	10 GALS./MO.	70 (a)/ FLOOR DRAINS, FLOOR DRAINS/ DPDO
			JP-4	10 GALS./MO.	
HH3E SEC[illegible]N (HELICOPTER MAINTENANCE)	43-550		ENGINE OIL	15 GALS./MO.	(a)/ FLOOR DRAINS, FLOOR DRAINS/ DPDO
			HYDRAULIC FLUIDS	5 GALS./MO.	(a)/ FLOOR DRAINS, FLOOR DRAINS/ DPDO
			JP-4	5 GALS./MO.	(a)/ FLOOR DRAINS, FLOOR DRAINS/ DPDO
			PD-680	55 GALS./MO.	(a)/ FLOOR DRAINS, FLOOR DRAINS/ DPDO
AEROSPACE SYSTEMS	42-425		HYDRAULIC FLUID	25 GALS./MO.	(a)/ FLOOR DRAINS, FLOOR DRAINS/ DPDO
			ENGINE OIL	10 GALS./MO.	(a)/ FLOOR DRAINS, FLOOR DRAINS/ DPDO
			PD-680	100 GALS./MO.	(a)/ FLOOR DRAINS, FLOOR DRAINS/ DPDO

KEY

———— CONFIRMED TIME FRAME DATA BY SHOP PERSONNEL

------ ESTIMATED TIME FRAME DATA BY SHOP PERSONNEL

NOTES

(a) STORAGE IN U/G TANK ADJACENT TO OLD POWER PLANT (11-433) SOME MATERIAL REMOVED BY OFF-BASE CONTRACTOR

(b) TO SURFACE DRAINAGE, PAVEMENTS AND GROUNDS FOR ROAD DUST CONTROL, FIRE TRAINING OF SALVAGE FOR CONTRACTOR DISPOSAL

TABLE 4.1 (Cont'd)

INDUSTRIAL OPERATIONS (Shops)

Waste Management

SHOP NAME	LOCATION (BLDG. NO.) PRESENT	LOCATION (BLDG. NO.) PAST	WASTE MATERIAL	WASTE QUANTITY	METHOD(S) OF TREATMENT, STORAGE & DISPOSAL 1940 1950 1960 1970 1980
616th CONSOLIDATED AIRCRAFT MAINTENANCE SQUADRON (Cont'd)					
PROPULSION SHOPS	43-006		HYDRAULIC FLUID ENGINE OIL	20 GALS./MO.	70 (a) 79 DPDO
			PD-680	55 GALS./MO.	STORM SEWER DPDO
REFURBISHMENT SECTION	42-300		MEK	<55 GALS./6 MOS.	FLOOR DRAINS FLOOR DRAINS/DPDO
			THINNER PAINT STRIPPER	<55 GALS./6 MOS.	FLOOR DRAINS FLOOR DRAINS/DPDO
			PD-680	<55 GALS./6 MOS.	FLOOR DRAINS FLOOR DRAINS/DPDO
FLIGHTLINE MAINTENANCE	43-575		ENGINE OIL HYDRAULIC FLUID JP-4	900 GALS./YR. 600 GALS./YR. 240 GALS./YR.	FLOOR DRAINS TO DRY WELL, FIRE TRAINING DRAINAGE DITCH DPDO
			PD-680	600 GALS./YR.	FLOOR DRAINS TO DRY WELL FIRE TRAINING DRAINAGE DITCH DPDO
USAF HOSPITAL					
DENTAL CLINICS	7-800 31-280 24-800		FIXER	20 GALS./WK. (EACH)	SANITARY SEWER 75 SILVER RECOVERY TO DPDO
			DEVELOPER	20 GALS./WK. (EACH)	SANITARY SEWER
X-RAY LABORATORY	24-800		FIXER	50 GALS./WK.	SANITARY SEWER SILVER RECOVERY TO DPDO
			DEVELOPER	30 GALS./WK.	SANITARY SEWER SILVER RECOVERY TO DPDO
HOSPITAL LAB	24-800		XYLENE	5-10 GALS./MO.	80 DPDO
616th AERIAL PORT SERVICE					
AERIAL DELIVERY FACILITY	32-060		PD-680	200 GALS./YR.	FLOOR DRAINS TO DRY WELL

KEY

——— CONFIRMED TIME-FRAME DATA BY SHOP PERSONNEL

- - - - ESTIMATED TIME FRAME DATA BY SHOP PERSONNEL

NOTES

(a) STORAGE IN U/G TANK ADJACENT TO OLD POWER PLANT (11-433) SOME MATERIAL REMOVED BY OFF-BASE CONTRACTOR

(b) TO SURFACE DRAINAGE, PAVEMENTS AND GROUNDS FOR ROAD DUST CONTROL, FIRE TRAINING OF SALVAGE FOR CONTRACTOR DISPOSAL

TABLE 4.1 (Cont'd)

INDUSTRIAL OPERATIONS (Shops)

Waste Management

SHOP NAME	LOCATION (BLDG. NO.) PRESENT	LOCATION (BLDG. NO.) PAST	WASTE MATERIAL	WASTE QUANTITY	METHOD(S) OF TREATMENT, STORAGE & DISPOSAL 1940 1950 1960 1970 1980
DET 5, 1369th AUDIOVISUAL SQUADRON					
PHOTO LAB	11-620		FIXER	30 GALS./MO.	SANITARY SEWER (NO SILVER RECOVERY) 70 SILVER RECOVERY TO DPDO
			DEVELOPER	30 GALS./MO.	SANITARY SEWER
ARMAMENT RECORDING LAB	11-300		FIXER	45 GALS./MO.	75 SILVER RECOVERY TO DPDO
			DEVELOPER	35 GALS./MO.	SANITARY SEWER
5099th CIVIL ENGINEERING OPERATIONS SQUADRON					
DIESEL MAINTENANCE	22-023		ENGINE OIL	55 GALS./MO.	(b) 68 (a) 79 DPDO
			DIESEL FUEL	55 GALS./MO.	(b) (a) DPDO
			CLEANING SOLVENT	15 GALS./MO.	(b) (a) DPDO
			TRICHLOROETHANE	30 GALS./MO	(b) (a) DPDO
			CONTAMINATED FUEL	20 GALS./MO.	(b) (a) DPDO

KEY

——— CONFIRMED TIME FRAME DATA BY SHOP PERSONNEL

- - - - - ESTIMATED TIME FRAME DATA BY SHOP PERSONNEL

NOTES

(a) STORAGE IN U/G TANK ADJACENT TO OLD POWER PLANT (11-433) SOME MATERIAL REMOVED BY OFF-BASE CONTRACTOR

(b) TO SURFACE DRAINAGE, PAVEMENTS AND GROUNDS FOR ROAD DUST CONTROL, FIRE TRAINING OF SALVAGE FOR CONTRACTOR DISPOSAL

occurred at the time mission changes were implemented. The shop functions in the past were, however, similar to their present functions. Consequently, many of the buildings which house the current shops, previously housed shops which had similar functions and generated similar types of waste. Whenever possible, the past locations of similar type shops have been identified on Table 4.1. Other buildings which housed aircraft maintenance shops in the past include buildings 32-179, 32-209, 32-060, 43-250, 43-450 and 32-050. The quantity of waste generated at each of these facilities was not known. It is, however, suspected that the types of waste potentially generated at these facilities include engine oil, hydraulic fluid, AVGAS, JP-4 and cleaning solvents. The method of disposal of these wastes was likely the same as the methods employed at other similar facilities in use at the time.

1940's - 1960's

During the early period of the base operations (1940's through early 1960's) the used oils, fuels and solvents were handled in one of several manners. Waste chemicals, particularly solvents were drained to the storm and sanitary sewers as well as floor drains which discharged directly to dry wells beneath or adjacent to the respective facilities. Some of the waste solvents generated in various shops were disposed directly into the surface drainage ditches. Waste oils and fuels generated in shops and along the flightline were also disposed of directly in surface drainage ditches. Combustible chemicals such as oils, fuels and solvents were also used during this period as fuel for fire training exercises. Additionally, some waste oils were removed by contractor or spread along the unpaved roads around the base for dust control during the summer months.

1960's - 1980

From the mid-1960's to the late 1970's the method for handling oils, fuels and hazardous waste entailed storing these wastes in centralized storage tanks. A principal collection point during this period was an underground tank adjacent to the old power plant (Building No. 11-433). The tank is presently locked and no longer re eives any wastes; however, approximately 105,000 gallons of waste oils and miscellaneous chemicals are still stored in the tank and await proper disposal. Some minor amounts of wastes were discharged to the floor drains leading either to the storm sewers, sanitary sewer or dry wells.

1981 - To Present

Since mid-1981 all waste chemicals have been temporarily stored at a hazardous waste storage area. The Defense Property Disposal Office (DPDO) arranges for contract disposal of these wastes. Used oils, fuels and hydraulic fluids have been stored in a segregated manner at central collection areas. DPDO also arranges for the contract removal of these materials. Only minor amounts of wastes, primarily generated from small spills occuring in the shop areas, still enter the floor drains of the various shop facilities. Most drains are linked to the sanitary sewer, storm sewer or dry wells.

Many of the outlying hanger facilities, where aircraft maintenance was conducted, have floor drains which discharged to dry wells beneath or adjacent to the buildings. These dry wells received many of the wastes generated in the facility as well as any spills which may have occurred. The facilities which still discharge to floor drains leading directly to dry wells are as follows: 42-400, 42-425, 43-550, 42-300, 43-410, 43-450, 21-900 and 32-060. A brief description of each facility and the types of wastes which were discharged into the floor drains is described in the following paragraph. Each site presents a potential for contamination, due to the nature of wastes disposed of in the dry well and, the porous nature of the subsurface deposits at the facility.

Site IS-1, Building 42-400 Floor Drains

Building 42-400 (Hangar 10) is used for fuel loading operations. The site has a potential for small spills. Base documents indicate that past spills, up to 1,300 gallons, have occurred at the facility. The drains in the building discharge into two dry wells (Site IS-1).

Site IS-2 Building 42-425 Floor Drains

Building 42-425 (Hangar 11) is used for aircraft maintenance. Approximately 100 gallons per month of the used PD-680 is known to have been rinsed into the floor drains to dry wells (Site IS-2).

Site IS-3 Building 43-550 Floor Drains

Building 43-550 (Hangar 14) is used for helicopter maintenance and contains a helicopter washrack. Approximately 55-gallons per month of

PD-680 is used in the wash operation. Some of the used PD-680 has been rinsed into the floor drains which lead to dry wells (Site IS-3).

Site IS-4 Building 42-300 Floor Drains

Building 42-300 (Hangar 8) has been the site of aircraft cleaning with PD-680. Painting of interior aircraft parts has been also performed at this location. The floor drains in the building discharge to a dry well (Site IS-4) and likely received rinse water and minor spillage from these industrial operations.

Site IS-5 Building 43-410 Floor Drains

Building 43-410 is used for refueling operations. There is one washrack for ground equipment at the end of the building. Approximately 55-gallons per month of PD-680 has been regularly used in this washrack. The drain goes to a dry well (Site IS-5).

Site IS-6 Building 43-450 Floor Drains

Building 43-450 (Hangar 15) is used for aircraft maintenance. There is no washrack in the hangar. Therefore, the primary waste which may have entered the floor drains would have been fuels originating from minor fuel spills. The floor drains in this building are also connected to a dry well (Site IS-6).

Site IS-7 Building 21-900 Floor Drains

Building 21-900, the automotive maintenance facility, is used to maintain most vehicles on base. A series of floor drains is connected to two sumps. The sumps drain into a seepage pit north of the building. Spilled petroleum porducts have been washed into the drain. Spent PD-680 used in vehicle cleaning operations has also been washed into the drains.

Site IS-8 Building 32-060 Floor Drains

Building 32-060 is utilized as the aerial delivery facility by the Aerial Port Squadron. The building houses many pieces of ground equipment. Approximately one 55-gallon drum of PD-680 is used every three months to clean this equipment. Some used PD-680 may enter the floor drains (four) which drain to dry wells adjacent to the building.

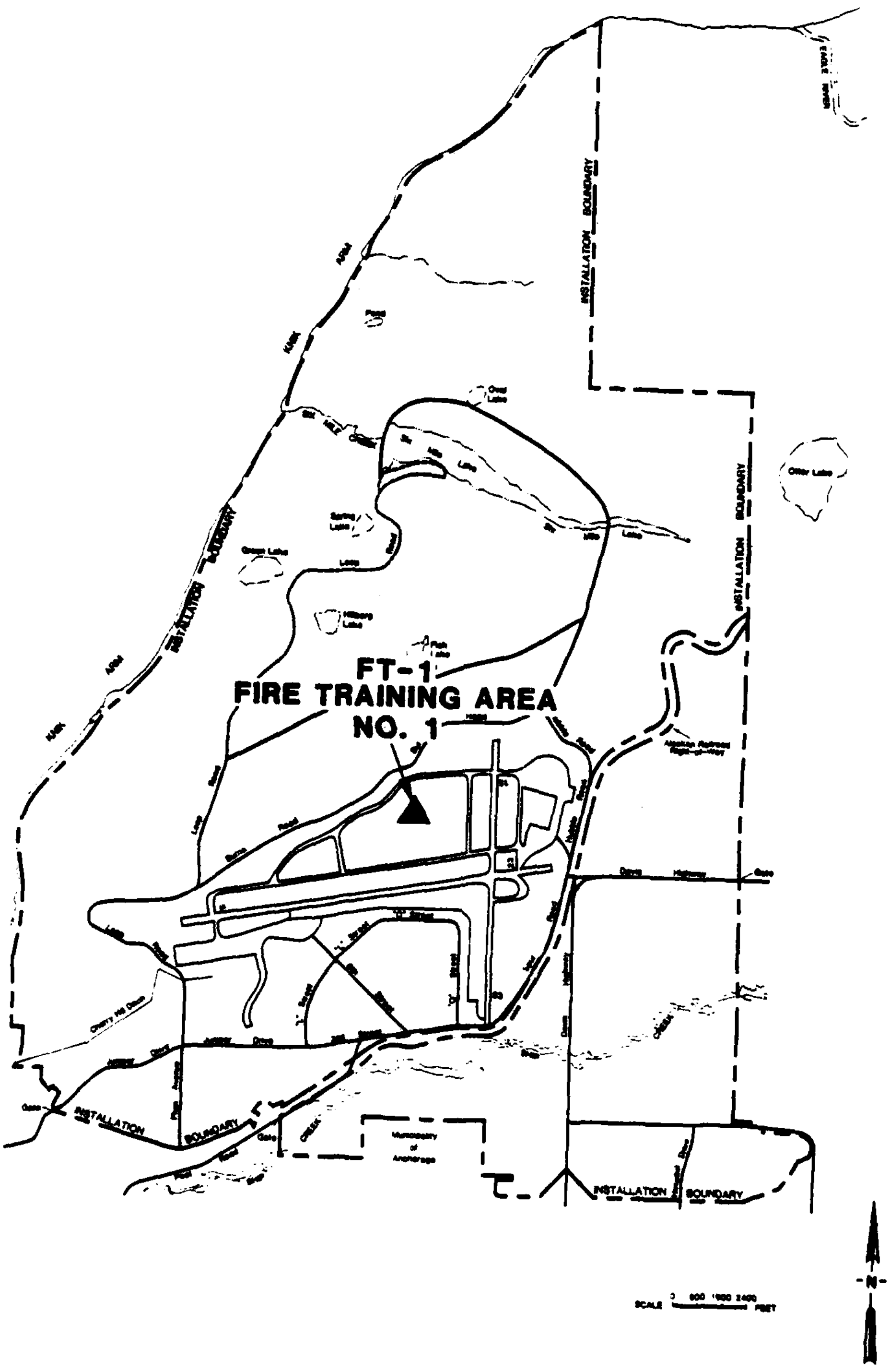
Fire Training (FT)

The Fire Department at Elmendorf AFB has operated only one fire training site on Elmendorf AFB. Site FT-1 (Figure 4.1) was used from the 1940's to 1983 as a fire training area. In the past, the site

FIGURE 4.1

ELMENDORF AFB

FIRE TRAINING AREA



SOURCE: ELMENDORF AFB INSTALLATION DOCUMENTS

consisted of a drum storage area and a bermed burning area. The drum storage area was used to store as many as 100 55-gallon drums of contaminated waste oils, paint thinners, waste fuel, and waste solvents from aircraft maintenance and the other shop operations on base. Until 1974, fire training activities occurred approximately once per month. During each exercise, 250 to 3,000 gallons of contaminated waste materials were spread on the water-saturated and bermed burn area and ignited. Protein foams or Chlorobromomethane were then used to extinquish the fire. From 1974-1978 only clean JP-4 jet fuel was used during exercises conducted twice per year. From 1978-1980 quarterly exercises were initiated and continue at present. The site is located on a level, gravel moraine area which soaks up water and residual materials rapidly. According to personnel interviews, the burn area remained saturated with unconsumed waste fuel following each fire training exercise. The berm does not totally enclose the site. Subsequently, runoff has been known to occur outside the bermed area during fire training exercises. However, the runoff normally does not travel too far horizontally due to the rapid infiltration rates at the site.

Visual examination of the area during the site visit indicated very small amounts of residual fuels in the burn area. However, due to the permeable soils and gravel till deposits at the site a potential for contaminant migration exists since much of the fuel and waste residues may have seeped into the ground. In addition to the fire training activities conducted at Site FT-1, a small area a few hundred feet east of the bermed burn area was used in the past for burial of empty drums and spent fuel filters. The site is presently covered with local gravel till. This disposal pit will be considered part of Site FT-1.

Fuels Management

The Elmendorf AFB petroleum product handling system includes substantial volumes of: JP-4 jet fuel, diesel fuel, aviation gasoline (Avgas), motor vehicle gasoline (Mogas), aircraft de-icing fluid and isopropyl alcohol. Storage capacities and normal annual usage rates for each of the products is presented in Table 4.2. The fuels management system contains approximately 30 miles of underground jet fuel and diesel fuel pipeline on base which interconnects 128 primary storage

TABLE 4.2
SUMMARY OF MAJOR PETROLEUM PRODUCT CAPACITIES

Item	Total Storage Capacity (gallons)	Recent Annual (1982) Usage (gallons)
JP-4 Jet Fuel	16,020,000	31,558,789
Diesel Fuel	1,053,700	1,420,124
Avgas	63,200	32,912
Mogas	234,300	696,240
Deicer	500,400	72,236
Alcohol	150,000	68,887

Source: Elmendorf AFB Records

tanks of 25,000 gallon capacity or greater, six tank farms, nine pump houses and a 60-hydrant refueling system. Most tanks (120 of 128) are below-ground. The fuels system is interconnected with the City of Anchorage dock facilities for off-loading from tankers. The base petroleum system is also connected with and served by a U.S. Army owned and operated 59-mile long fuel delivery line from Whittier, Alaska. The Department of the Army is responsible for purchase and delivery of fuel to the base.

Residuals from tank cleanouts have been disposed of at Site D-15 (POL Sludge Disposal Site No. 1 1964-1968) and Site D-16 (POL Sludge Disposal Site No. 2 1970-1983). In addition fuel filters have been weathered at these locations.

As a result of the large and complex petroleum product storage and distribution system at Elmendorf AFB a number of significant spill events have occurred since the base was activated (Figure 4.2). The available written history of major spill events at Elmendorf AFB is limited to spills which have occurred since 1974. However, there were major spill events prior to 1974 which were not adequately documented. These events are presented in this report as a result of extensive personnel interviews with past and present employees. A summary of major spill events is presented in Table 4.3.

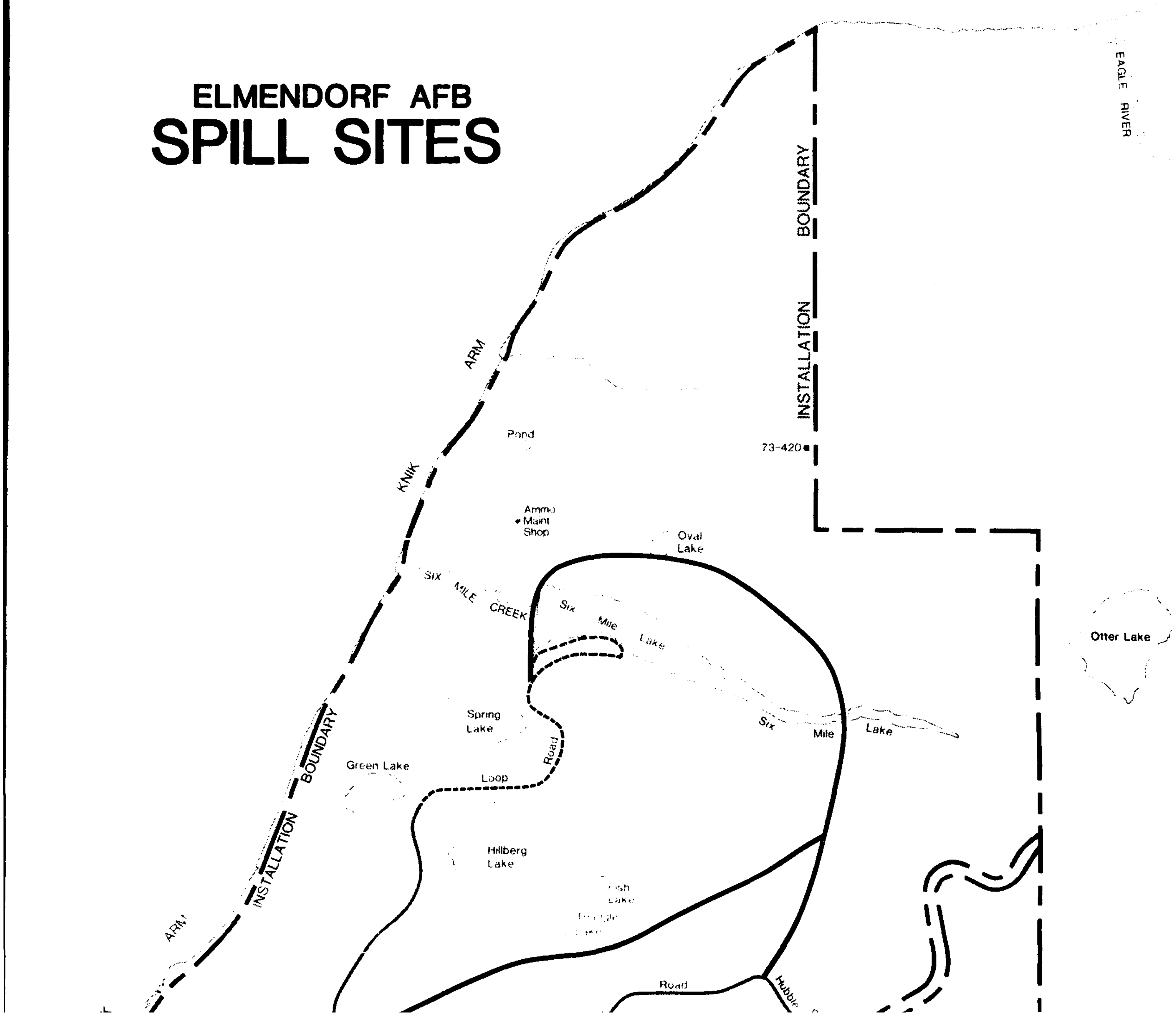
Site SP-1 Diesel Fuel Line Leak

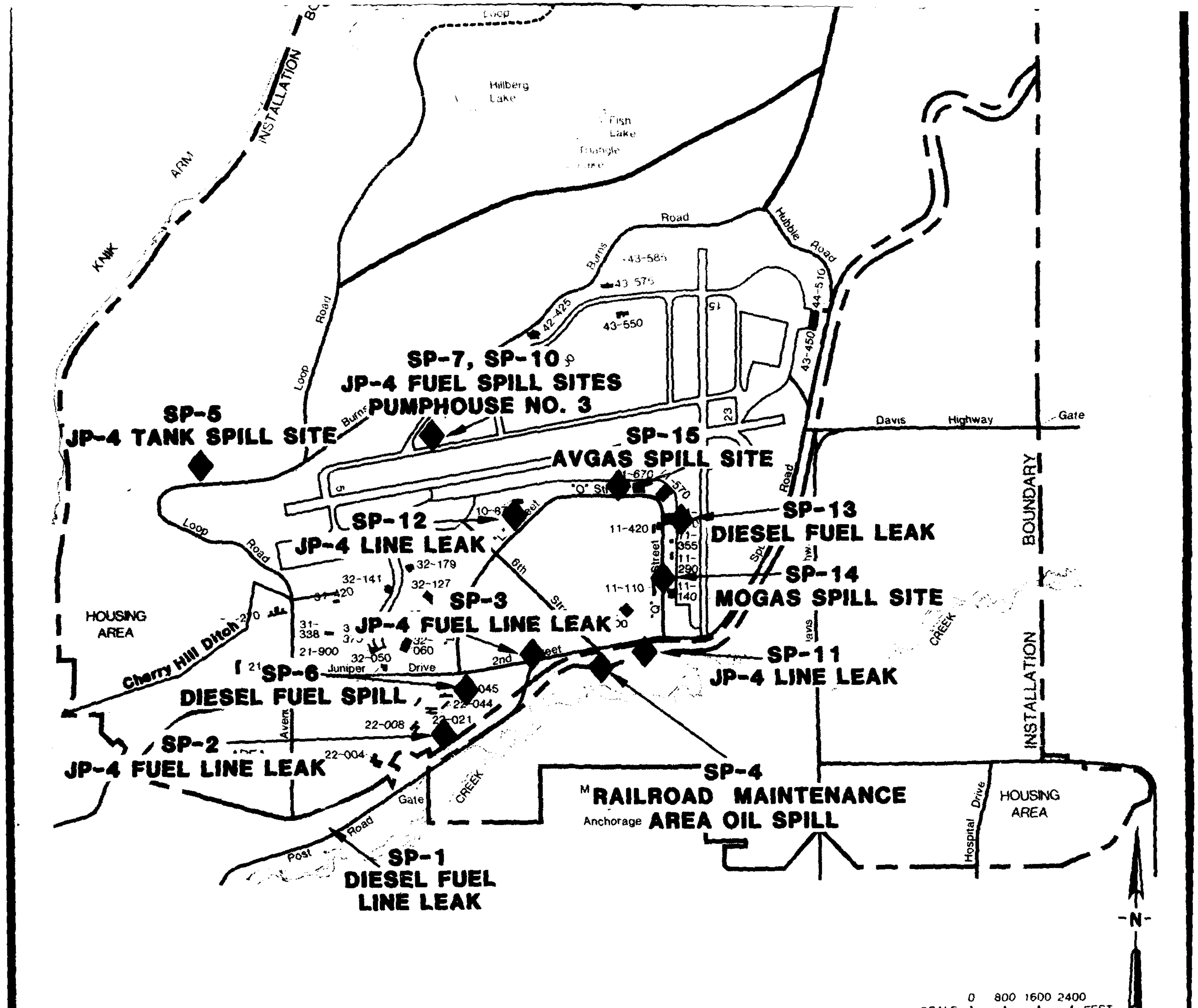
During 1956 to 1958 a diesel fuel line break occurred just south of the Corps of Engineers Building. Diesel fuel seeped out of the ground near the railroad tracks. Thousands of gallons of diesel fuel were recovered at this location during the late 1950's. An unknown amount may have remained below ground. Due to the porous nature of the gravel moraine and the site's proximity to Ship Creek, a potential for contamination exists.

Site SP-2 JP-4 Fuel Line Leak

As a result of a fuel line leak, an unknown quantity of JP-4 seeped out of the bank southeast of Building 22-010, near the drainage ditch crossing Post Road (Site SP-2) during 1964-1965. In fact, this area was known for periodic seeps throughout the 1950's and 1960's. No fuel was recovered at this location. The potential for contamination exists at

ELMENDORF AFB
SPILL SITES





SOURCE: ELMENDORF AFB INSTALLATION DOCUMENTS

TABLE 4.3
SPILL AREA INFORMATION SUMMARY

Site No.	Site Description	Date of Spill	Type of Wastes Spilled	Quantity of Waste Spilled (gallons)	Extent of Cleanup Action
SP-1	Diesel Fuel Line Leak	1956-1958	Diesel Fuel	Several Thousand	Unknown
SP-2	JP-4 Fuel Line Leak	1964-1965	JP-4	Unknown	Unknown
SP-3	JP-4 Fuel Line Leak	1968	JP-4	<200	Contaminated soil excavated and hauled to landfill (Site D-7)
SP-4	Railroad Maintenance Area Oil Spill	Late 1960's	Maintenance Oil	Unknown	Unknown
SP-5	JP-4 Bulk Storage Tank Spill	1)Aug 30, 1974 2)Mid-1960's	JP-4 Avgas	33,000 60,000	Majority of both spills seeped into the ground in vicinity of bulk storage tanks.
SP-6	Diesel Fuel Spill (Bldg. No. 22-013)	Mar 31, 1976	Diesel Fuel	2,000	None of spill reached surface waters - frozen ground prevented appreciable fuel penetration into soil. Most of spill was diverted to catchment locations and removed.
SP-7	Pumphouse No. 3 JP-4 Fuel Spill	Sep 27, 1980	JP-4	36,000	700 gallons of fuel were recovered. Remaining fuel seeped into the ground.
SP-8	Hardstand No. 5 JP-4 Fuel Spill	Nov 26, 1980	JP-4	200	No fuel was recovered. Fuel-saturated snow and ice was removed to a disposal area (Landfill Site D-7). No fuel reached surface waters.
SP-9	C-5 Aircraft Parking Apron JP-4 Spill	Mar 4, 1983	JP-4	3,000	500 gallons of fuel were recovered. Remaining fuel seeped into the ground.
SP-10	Pumphouse No. 3 JP-4 Fuel Spill	1964-1965	JP-4	50,000	Most of fuel seeped into the ground in the vicinity of the pumphouse. No fuel reached surface waters.
SP-11	JP-4 Line Leak (Bldg. 23714)	1978	JP-4	Unknown	Line repaired.
SP-12	JP-4 Line Leak	1971	JP-4	1,000	All fuel spill cleaned up.
SP-13	Diesel Fuel Line Leak	1968	Diesel Fuel	800	Unknown
SP-14	Mogas Spill	1965	Mogas	1,500	Unknown
SP-15	Avgas Spill	1961	Avgas	1,000	Unknown
SP-16	JP-4 Spill	1965-1966	JP-4	5,000	Unknown

Site SP-2 due to the nature of the material spilled and the proximity of the spill to Ship Creek.

Site SP-3 JP-4 Fuel Line Leak

In 1963 less than 200 gallons of JP-4 leaked onto the grass at Site SP-3. The top half foot of contaminated soil was excavated and hauled to the base landfill (Site D-7). Since the majority of this small spill was contained in the excavated soil, no potential for contamination exists at this site.

Site SP-4 Railroad Maintenance Area and Spill

During the late 1960's "brownish oil globs" were noticed seeping out of the bank near the railroad maintenance facility (Site SP-4) into the marsh area south of the facility and flowing into Ship Creek.

Some of the oily material actually sank in the marsh area. The source of the oil was presumed a result of maintenance activities at the railroad facility. Since the marsh area is a direct pathway for contaminant migration to Ship Creek, a potential for contamination exists at the site.

Site SP-5 JP-4 Tank Spill

Site SP-5, Bulk Fuel Storage Tanks Nos. 601-604, has been the site of numerous spills since the tanks were installed in the early 1940's as Avgas storage tanks. A 60,000 gallon Avgas spill was known to occur in the mid-1960's when the U.S. Army still managed the facility. None of the Avgas was recovered. On August 30, 1974, an estimated 33,000 gallon spill of JP-4 jet fuel occurred when an underground tank was filled beyond capacity. Approximately 16,000 gallons of fuel were recovered. The remainder (17,000 gallons) seeped into the ground northwest of the tanks. Cleanup efforts prevented fuel from reaching surface waters.

During the site inspection conducted in May, 1983, several fuel seeps were observed in the drainage ditch over the hill (south) of the storage tanks and in the flat areas further south of the road (Appendix F). As a result of past spills and the present observed contamination, a potential exists at Site SP-5 for contaminant migration.

Site SP-6 Diesel Fuel Spill (Bldg. No. 22-013)

An estimated 8,000 gallon spill of diesel fuel occurred on March 31, 1976. The spill occurred during transfer of fuel from an above-ground tank to an underground tank when the overflow valve failed.

Collection ditches were excavated in the ice and snow to channel spilled fuel to catchment locations, where it was removed by pumping into a tanker. Since the ground was frozen at the time of the spill, no appreciable fuel penetrated the subsurface and none of the fuel reached surface waters. As a result of the recovery operation and frozen site conditions, no potential for contamination exists at this site.

Sites SP-7 and SP-10 Pumphouse No. 3 JP-4 Fuel Spills

Pumphouse No. 3 has been the site of several small and major spills in the past. During 1964-1965, a 50,000 gallon JP-4 fuel occurred as a result of a pumphouse failure. None of this spill was recovered as it seeped into the highly porous gravel moraine in the vicinity of the site (SP-10). On September 27, 1980, approximately 36,000 gallons of JP-4 was spilled onto the ground north of Building No. 42-103 during refueling of a C-5 aircraft (Site SP-7). The cause of the spill was the failure of a diaphram in the 302 refuel/defuel valve in control pit 3-4, allowing a bypass to open and overfill an underground tank. Fuel was lost through the vent pipe on the north side of Building 42-103. About 700 gallons of fuel were recovered, and the remainder was lost to the porous soil. A 14-foot deep pit was dug to recover additional fuel, but was unsuccessful. No fuel was discharged to surface waters. As a result of past spills of JP-4 and the permeable nature of area soils a potential for contamination exists at this location.

Site SP-8 Hardstand No. 5 JP-4 Fuel Spill

An estimated 200 gallons of JP-4 jet fuel were spilled on November 26, 1980, on Hardstand 5 due to a frost-heaved fuel line pipe cap that was severed by a snowplow during snow removal operations. No fuel was recovered for usable purposes, however, fuel saturated snow and ice was removed to a disposal area (Site D-7). No fuel reached surface waters at the time of the incident and no present potential exists for contamination as a result of the cleanup activities at the site.

Site SP-9 C-5 Aircraft Parking Apron JP-4 Spill

On March 4, 1983, a JP-4 fuel spill of about 3,000 gallons was discovered on the C-5 parking apron. Most of the fuel were recovered. The site does not present a potential for contamination.

Site SP-11 JP-4 Line Leak (Bldg. No. 23-714)

A JP-4 leak was discovered along the banks of a small stream north of the two-840,000 gallon JP-4 storage tanks (Site SP-11). The leak was the result of an underground pipe crack which occurred in 1978. The pipe was repaired. The quantity of fuel spilled at the time could not be determined. However, at present there is a small amount of JP-4 seeping out of the bank in the same area as Site SP-11. The material will eventually seep into the stream and travel via the marsh area to Ship Creek. A potential for contamination exists as a result of this seepage.

Site SP-12 JP-4 Line Leak

An approximate 1,000 gallon JP-4 leak was detected in 1971 at Site SP-12. The majority of the spill was recovered and contaminated soil was removed for disposal at the base landfill (Site D-7). No potential exists for contamination at this location.

Site SP-13 Diesel Fuel Line Leak

A diesel fuel spill occurred due to a line leak at site SP-13 in 1968. Approximately 700-800 gallons of diesel fuel seeped into the ground in the vicinity of the site. None of the fuel was recovered. The site presents a potential for contamination.

Site SP-14 Mogas Spill

Near Building No. 11-110, at the site of old building No. 1892, a 25,000 gallon tank was used to store Mogas in the 1960's. In 1965, a 1,500 gallon Mogas spill occurred at the gas station located nearby. No Mogas was recovered as the material seeped into the ground. A potential for contamination exists at this location.

Site SP-15 Avgas Spill

A 1,000 gallon Avgas spill occurred at site SP-15 in 1961. The majority of the spill was contained and collected. However, since some of the Avgas seeped into the ground a potential for contamination exists at this location.

Site SP-16 JP-4 Tank Truck Spill

An approximate 5000 gallon JP-4 fuel spill occurred in 1965 at site SP-16, a tank truck sump drain. The entire contents of the spill were recovered. No potential for contamination exists.

DESCRIPTION OF PAST ON-BASE DISPOSAL METHODS

The facilities at Elmendorf AFB which have been used for the management and disposal of waste can be categorized as follows:

- o Waste storage sites
- o Disposal sites (including EOD training)
- o Low-level radioactive waste disposal sites
- o Sanitary sewer system
- o Oil/water separators
- o Storm drainage system

These waste management facilities are discussed individually in the following subsections.

Waste Storage Sites

The major storage areas are identified on Figure 4.3.

Pesticide Utilization

Elmendorf AF has conducted a pest control program since the early 1960's. The pesticide program involves the routine and specific job order application of pesticide control agents. These materials were utilized in accordance with Air Force Regulations (AFR) 91-16, 91-19 and 91-21. Pesticides and herbicides are stored in a locked area of the Entomology Shop, 21 CSG, buildings 22-021 (Site S-1). Appendix E, Table E.1 includes a list of pesticides currently in use or storage. Prior to January, 1983, herbicides were stored by Pavements and Grounds at Building 9-180.

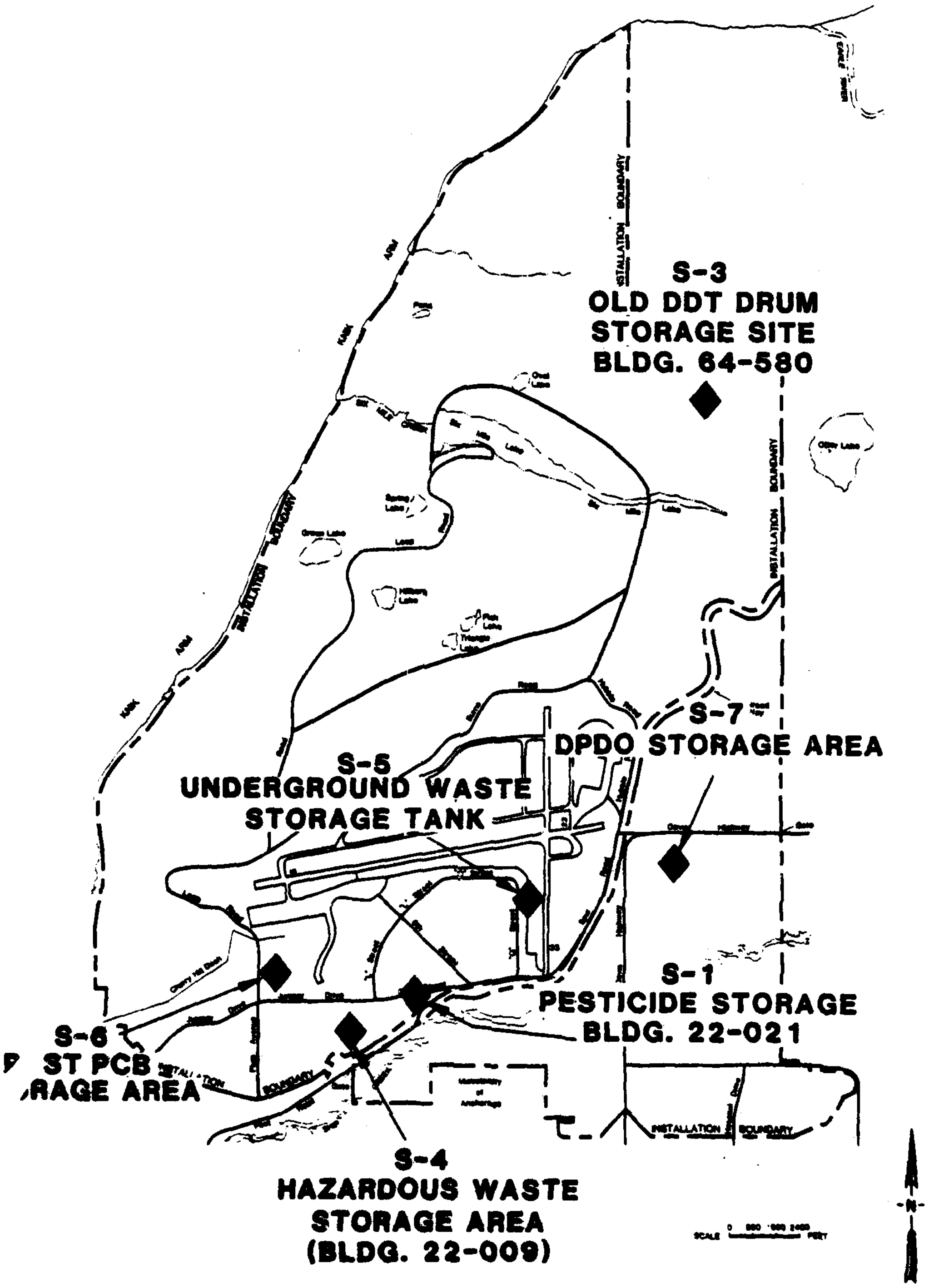
Historically (dates unknown), off-specification, outdated or unwanted materials disposal was conducted through DPDO. Empty containers were disposed to the base landfill (Site D-7). Currently, empty pesticide containers are thoroughly rinsed and crushed prior to disposal. Washwater is flushed to the sanitary sewer system. Bulk disposal is managed by DPDO. Personnel interviewed had no knowledge of any pesticide or herbicide spills. Site S-1 is not considered to be a potential for contamination.

Approximately 100 55-gallon drums of 20 percent DDT and other pesticides were stored at Site S-3 during the early 1960's prior to

FIGURE 4.3

ELMENDORF AFB

WASTE STORAGE SITES



SOURCE: ELMENDORF AFB INSTALLATION DOCUMENTS

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off-site contract disposal. Personnel interviewed had no knowledge of any spills at this location.

Other Waste Storage Sites

Both during the past and in the present, used oils and solvents have been temporarily stored in drums at the point of generation (usually industrial shop facilities). Presently, many of the shops which are located in adjacent areas have established central accumulation points which have bowsers designated for the storage of specific used materials (i.e. synthetic oils, non-synthetic oils and fuels). These bowsers are periodically pumped by an outside contractor for off-base disposal. The contracts are arranged by DPDO. Table 4.4 lists the accumulation points, the work center using the particular accumulation point and the responsible agency. No significant spills are known to have occurred in any of these areas. Hazardous wastes are taken to the approved hazardous waste storage facility (Site S-4 - Building 22-009). Due to the enclosed nature of the storage facility and no evidence of spillage, Site S-4 presents no potential for contamination.

During the 1950's and 1960's many of the hazardous wastes and oils generated at shops on the base were temporarily stored in drums and eventually taken to the fire training area (Site FT-1) for disposal. The fire training area was reported to have been a storage site for a large quantity of 55-gallon drums. From the late 1960's until the late 1970's, a 338,000 gallon underground storage tank (Site S-5) located adjacent to the old power plant (Building 11-433) was used to store used oils, hydraulic fluid and solvents as well as other miscellaneous waste generated from the industrial shops in the main flightline area. On occasions, the tank was pumped and the waste materials were either used as fuel for fire training exercises, used for dust control on base roads or disposed of off-base by a contractor. The inlet to the storage tank has been fenced. The tank has been restricted from storing any additional wastes; however, the tank still contains approximately 105,000 gallons of comingled wastes awaiting proper disposal. No evidence of tank spillage or leakage exists at Site S-5. Since the hazardous wastes are contained no potential for contaminant migration exists.

PCB transformers were stored at Site S-6, the old ITT facility, during the 1970's. No significant spillage of transformer oil is known

TABLE 4.4
USED OIL AND HAZARDOUS WASTE ACCUMULATION POINTS

Facility Number	Work Center	Responsible Organization
32-050	Corrosion Control	21 TFW/EMS
22-044	Interior Electric Shop	21 CES
22-021	Machine Shop	21 CES
22-045	Paint Shop	21 CES
22-023	Diesel Maintenance	21 CES
21-200	Auto Hobby Shop	21 CSG/SS
11-110	Jet Engine Shop	21 TFW/CRS
32-141	Heavy Equipment Repair	21 TFW/LGT
22-064	PMEL	21 TFW/CRS
31-270	Barometer Repair	1931 CG
44-510	Armament Shop	21 TFW/EMS
31-420	Welding and Plating Shop	21 TFW/CRS
21-900	Motor Pool	21 TFW/LGT
31-338	Refueling Maintenance	21 TFW/LGT
32-127	AGE Maintenance	21 TFW/EMS
42-400	Fuel Cell	21 TFW/EMS
(Vicinity of 11-355)	Tip-Tank Farm	21 TFW/EMS
43-575	MAC Collection Point	616 MAG
73-420	EOD Disposal Range	21 TFW/EMS

Source: 21st TFW OPlan 19-3, Elmendorf AFB to exist at this location. However, due to the large quantity of PCB transformers stored at this location a potential for contamination is probable.

Area "D" (Site S-7) of the Defense Property Disposal Office (DPDO) of Elmendorf AFB has been used to store partially empty 55-gallon drums. As many as 1,500 50-gallon drums have been stored per year. No known spills exist. Based on a visual inspection of the site, the area presents no potential for contamination.

Disposal Sites

The majority of general refuse at Elmendorf AFB has been disposed of on base at various landfills. Limited records exist regarding the disposal sites at Elmendorf AFB. The majority of information collected regarding the disposal sites was obtained through personnel interviews with current and retired employees. A description and evaluation of each site is presented herein. Table 4.5 summarizes pertinent information for each of the disposal sites illustrated in Figure 4.4.

Site D-1 Landfill (West Overrun)

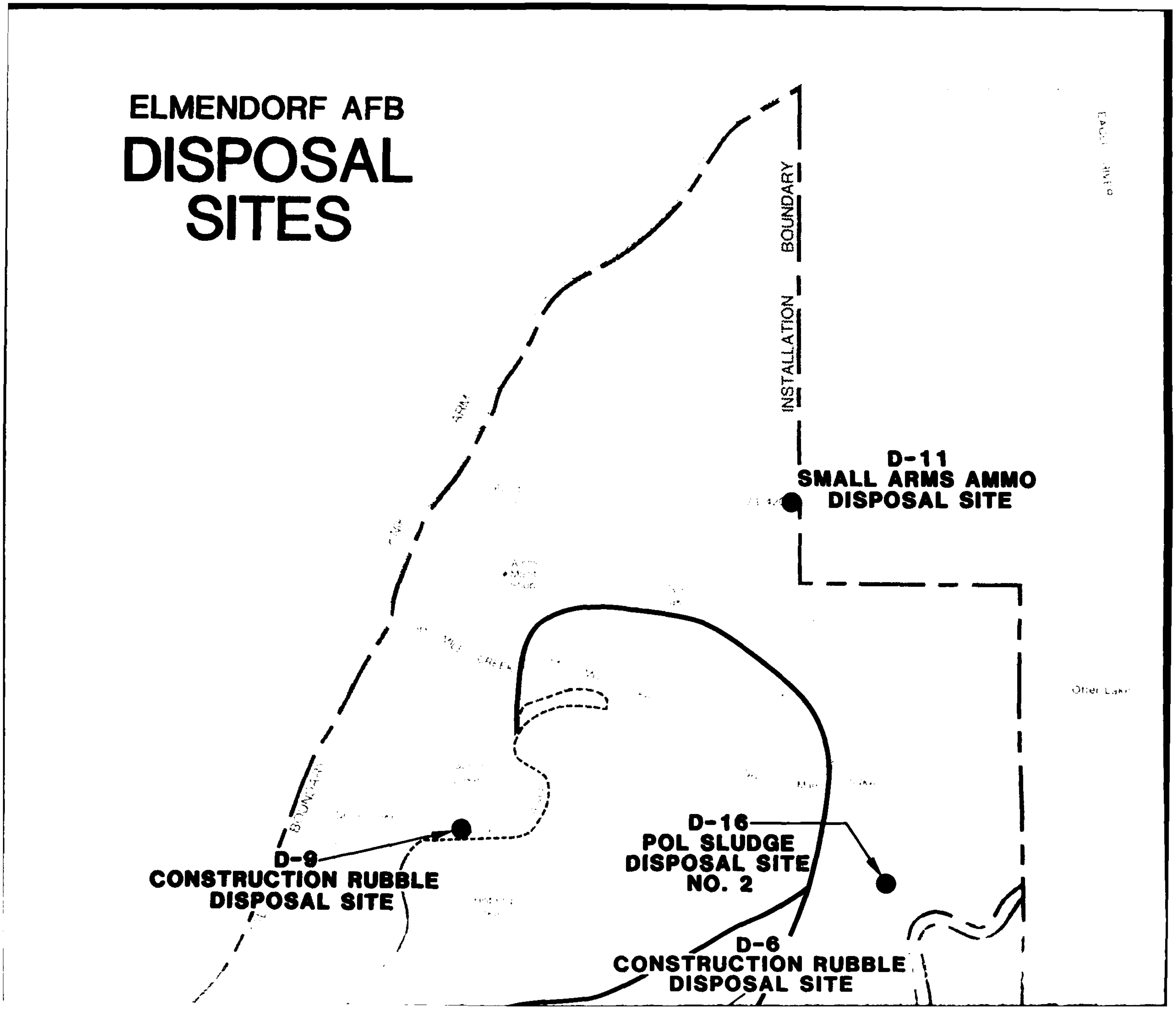
During the initial construction and operation of Elmendorf AFB (1938-1941), Site D-1, located under the present west overrun, was used for disposal of innocuous wastes. This site was used primarily for disposal of hardfill, construction rubble, and general refuse using an area fill operation. No hazardous wastes are known or suspected of being disposed of at this location. Due to the non-hazardous nature of the wastes disposed of, the age of the site, and the existence of a cap (west overrun pavement) Site D-1 presents no potential for environmental contamination.

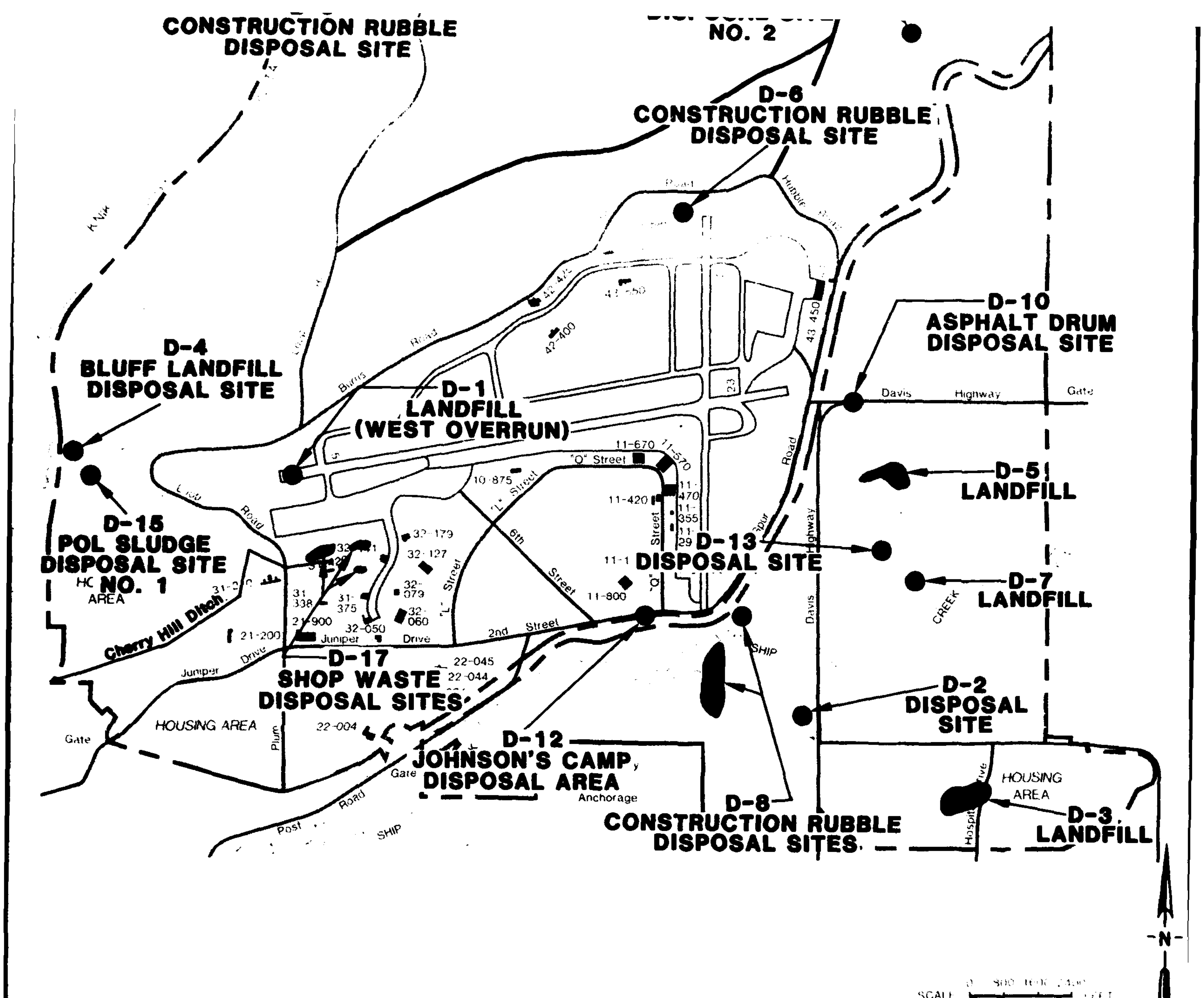
Site D-2 Disposal Site

An area (Site D-2) was used as a surface dump for general refuse, timber, and scrap metal from 1940 to 1942. No daily cover was applied at this location. No hazardous wastes were disposed of at this site. At present the site is covered with local soil and vegetation. This site is not considered a potential for environmental contamination due to the innocuous nature of the wastes disposed of and the age of the site.

TABLE 4.5
DISPOSAL SITE INFORMATION SUMMARY

Site No.	Operation Period	Approximate Size	Type of Wastes	Method of Operation	Closure Status	Surface Drainage	Site Visit Comments
D-1	1938-1941	7 acres	Hardfill, construction rubble, general refuse.	Area fill Depth: 10 feet	Area covered with several feet of local soil and overrun pavement.	To Cherry Hill Ditch	No evidence of contamination.
D-2	1940-1949	8 acres	Hardfill, construction rubble, general refuse.	Area fill, surface dump, no daily cover.	Area covered with several feet of local soil.	To Ship Creek	No evidence of contamination.
D-3	1943-1957	<1 acre	Hardfill, construction rubble, general refuse, wood. Spent WWII small arms ammo.	Surface dump. No daily cover.	Area covered with several feet of local soil.	To Ship Creek	No evidene of contamination.
D-4	1945-1957	2 acres	Construction rubble, general refuse, cars.	Surface dump over hill to Knik Arm.	Partially covered with local soil along hillside.	To Knik Arm	Abandoned cars, uncovered rubble.
D-5	1951-1973	17 acres	Scrap metal, general refuse, construction rubble, drums of spent chemicals (type: unknown), miscellaneous junk.	Trench excavation. Depth: 14'-16'	95 percent of site covered with local soil, brush and small trees. Small area east of DPDO yard remains an open pit.	To Ship Creek	Uncovered mattresses in open pit.
D-6	1951-1964		Construction rubble.	Gravel pit area filled with rubble.	Closed with local soil.	To Ship Creek	No evidence of contamination.
D-7	1965-1983	12 acres	General refuse, garbage, full asphalt drums, miscellaneous shop waste.	Gravel pit. Depth: 40'	Southeast pit area closed with local soil. New pit currently in use.	To Ship Creek	Evidence of leak in asphalt drums in landfill cut.
D-8	1965-1983	24 acres	Construction rubble.	Gravel pit area.	Closed with local soil.	To Ship Creek	No evidence of contamination.
D-9	1964-1976	4 acres	Construction rubble: building debris, old cars, refrigerators.	Gravel pit area. Depth: 10'-12'	Closed with local soil.	To Six Mile Creek	No evidence of contamination.
D-10	1940-1950	5 acres	Abandoned asphalt drums and asphalt pit (several thousand drums).	Surface storage.	Not closed.	To Ship Creek	Rusty, deteriorated drums of asphalt scattered over the area. Some solidified asphalt evident on ground.
D-11	1940's-Present	<1 acre	Small arms ammo, signal devices, pyrotechnics expired shelf life egress components, scrap metal.	Burned and residues buried at shallow depth.	Active.	To Six Mile Creek	No evidence of contamination.
D-12	Unknown (1940's-50's)	<1 acre	General refuse, hardfill, construction rubble.	Area fill.	Closed with local soil cover.	To Ship Creek	No evidence of contamination.
D-13	1967-1971	2 acres	Metal piping, empty drums, asphalt drums, quicklime.	Trench and fill in ground pit area.	Closed with local soil, vegetation and brush covering the area.	To Ship Creek	No evidence of contamination.
D-15	1964-1968	<1 acre	POL tank cleanouts, fuel filters.	Area fill.	Closed with local soil, vegetation.	Knik Arm	No evidence of contamination.
D-16	1970's-1983	<1 acre	POL tank cleanouts, fuel filters.	Dry on concrete pad.	Open - active.	To Six Mile Lake	Fuel filters, fuel pads. Small of fuel pervasive in the area.
D-17	1950's-1960's	<1 acre	Waste solvents, paint thinners and other liquid waste from shop operations.	Spill into ditch.	Non-active.	To Cherry Hill Ditch	One empty drum of TCE lying in the ditch.


ELMENDORF AFB
DISPOSAL
SITES
INSTALLATION BOUNDARY
ARM
D-11
SMALL ARMS AMMO
DISPOSAL SITE
D-16
POL SLUDGE
DISPOSAL SITE
NO. 2
D-9
CONSTRUCTION RUBBLE
DISPOSAL SITE
D-6
CONSTRUCTION RUBBLE
DISPOSAL SITE



SOURCE: ELMENDORF AFB INSTALLATION DOCUMENTS

Site D-3 Landfill

The Site D-3 landfill, near the housing area, was used from 1943 until 1957 for disposal of general refuse and construction rubble generated from base operations. Both trench and fill and surface dump operations were used at this location. Based on interviews with personnel familiar with operations at the site, the U.S. Army disposed of spent small arms ammo (WWII) at this location. In addition small quantities of shop wastes may have been disposed of. No daily cover was used at this site. Some open burning occurred during the 1950's at Site D-3. In fact, due to subsequent odor and nuisance complaints, the site was closed in 1957. At present the area is covered with local soil and supports a substantial overgrowth of trees and brush. Due to the presence of small quantities of hazardous wastes disposed of, Site D-3 presents a potential for contamination.

Site D-4 Landfill (Bluff)

Site D-4 was used as a surface dump from 1945-1957 for disposal of old cars, construction rubble and small quantities of general refuse. The materials were dumped over the hill toward Knik Arm. At present, the rubble and old cars are still visible over the steep banks leading to Knik Arm. This site is not considered a potential for environmental contamination due to the innocuous nature of wastes disposed of at this location.

Site D-5 Landfill

Site D-5 was used as a disposal area for general refuse and other base generated wastes from 1951 to 1973. Trenches were excavated at this 17 acre site to a depth of 14-to-16 feet in most areas. However, on the east side of the landfill one 50-feet wide and 30-feet deep trench was excavated. Solid wastes were then disposed of in the trenches and covered daily with local soil. In addition to scrap metal, general refuse and construction rubble, drums of spent chemicals, partially full cans of herbicides and paint cans were disposed of at this location. The majority of the site is closed with several feet of local cover, vegetation and small trees. However, one small pit is still open just west of the DPDO storage yard which contains miscellaneous rubbish, including mattresses. Based on visual examination of the area, no evidence of vegetation stress, leachate or other contamination exists.

However, due to the presence of small quantities of hazardous waste and the porous nature of the gravel till at the site a potential for contamination exists.

Site D-6, D-8, D-9, D-12 Construction Rubble Disposal Sites

Several inactive disposal sites at Elmendorf AFB (Site D-6, Site D-8, Site D-9 and Site D-12) were used to dispose of construction rubble generated due to the changes in base operation and renovation of various areas on the base. All sites (except D-8) are presently closed. Based on a site inspection, the sites present no visual evidence of contamination. Due to the inert nature of the waste deposited at these locations, a potential for contamination does not exist.

Site D-7 Landfill

Since 1965, Site D-7 has been used for the disposal of base generated general refuse, scrap metal, construction rubble, drums of asphalt, empty pesticide containers and miscellaneous small quantities of shop waste (1960's only). Two gravel pits (30-40' deep) have been operated using area fill methods. One pit was closed in March, 1982, with 2-4' local soil cover. The base is in the process of adding top soil and seeding. The second pit has been used during the past year and is located a few hundred yards northeast of the closed pit. The site is presently monitored on a quarterly basis via sampling of three monitoring wells located within and adjacent to the closed pit. No contamination is evident based on results of monitoring to date. However, based on water level contour information for the site, the wells are not located in a hydraulically downgradient position with respect to the site. Considering: 1) the presence of small quantities of hazardous materials disposed at the site, 2) the porous nature of gravel pits, 3) the short distance from the bottom of the fill to the water table, and 4) the well situated in the middle of the fill, a potential for contamination and contaminant migration exists.

Site D-10 Abandoned Asphalt Drum Dump

Several thousand full and partially full 55-gallon drums of asphalt were stored at Site D-10 during the operation of the old asphalt plant on base during the 1940's and 1950's. Many of those drums still remain in an area of dense brush overgrowth. The site also contains an approximate 10' x 12' wooden pit containing five-to-six feet of viscous liquid asphalt. Most of the asphalt has solidified either within the drum or after leaking outside the drum on the ground surface. The material does not pose a potential for hazardous contaminant migration. However, the site presents a base safety hazard (particularly the pit which is not fenced or posted).

Approximately 100 yards east of the liquid asphalt pit a group of 15-20 partially full 55-gallon drums were found stored on the ground. These drums appeared much newer than the thousands of rusty asphalt drums scattered throughout the area. The content of the drums was liquid, but of unknown origin.

Site D-11 Small Arms Ammunition Disposal Area

Explosive ordnance disposal is conducted on the explosive materials disposal range, by 21 EMS. The materials disposed may include:

- o Small areas ammunition
- o Expired shelf life egress components
- o Signal devices/pyrotechnics
- o Bulk explosives

Materials are rendered harmless by burning in the burn pit north of the small arms range. Unburned materials, such as scrap metal are buried in the residue pit located near facility 73-420. This methodology has been used since 1963. Due to the inert nature of the materials disposed and the remote location of the site, no potential for environmental contamination is expected at Site D-11.

Site D-13 Disposal Site

An approximate two acre disposal site (D-13) was used from 1967-1971 to dispose of empty drums, metal piping, drums full of asphalt and small quantities of quicklime from base renovation operations. The material was filled into an old gravel pit. At present the site is closed with local soil cover and contains a growth of dense brush. Due to the innocuous nature of wastes disposed at this location no potential for contamination exists.

Site D-15 POL Sludge Disposal Site No. 1

A small area on the west side of the base between the bluff and the POL Tank Farm was used from 1964 to 1968 to dispose of sludge generated from POL tank cleanouts on the base. Fuel filters and pads were also weathered at this location. The site is presently covered with local soil and vegetation and is posted with a sign. Due to the nature of the wastes disposed of, this site presents a potential for contamination.

Site D-16 POL Sludge Disposal Site No. 2

Since the early 1970's, Site D-16 has been used for weathering fuel filters, pads and tank cleanout sludges. Most of the fuel filters and pads are allowed to "weather" on concrete slabs. Based on a site inspection the area contained an obvious fuel odor, minor fuel stains were evident around the concrete slab and the area was scattered with filter and pads. Due to the nature of the materials weathered at this location, the site presents a potential for contamination.

Site D-17 Shop Waste Disposal Site

Site D-17, consisting of a natural trench area (Cherry Hill Ditch) near the runway, was used during the 1950's and 1960's as a disposal area for waste solvents, paint thinners, and other liquid wastes generated in shop operations. The materials were poured into the ditch. During the site visit an empty TCE drum was observed in the brush along the banks of the trench. The area is presently covered with a dense growth of brush. Due to the toxicity and persistence of the materials disposed of at this location and the porous nature of the subsurface deposits a potential for contamination exists.

Low-Level Radioactive Waste Disposal Site

A low-level radioactive waste disposal site existed at Elmendorf AFB (Site RD-1) as illustrated in Figure 4.5. Although suspected small quantities of cyanide and radium were disposed at this location radioactive analysis found that no radioactivity above background levels was detected. In 1980, the materials were exhumed and properly disposed of by off-site contract disposal. Based on results of site monitoring conducted by the Air Force, no present potential for contamination exists.

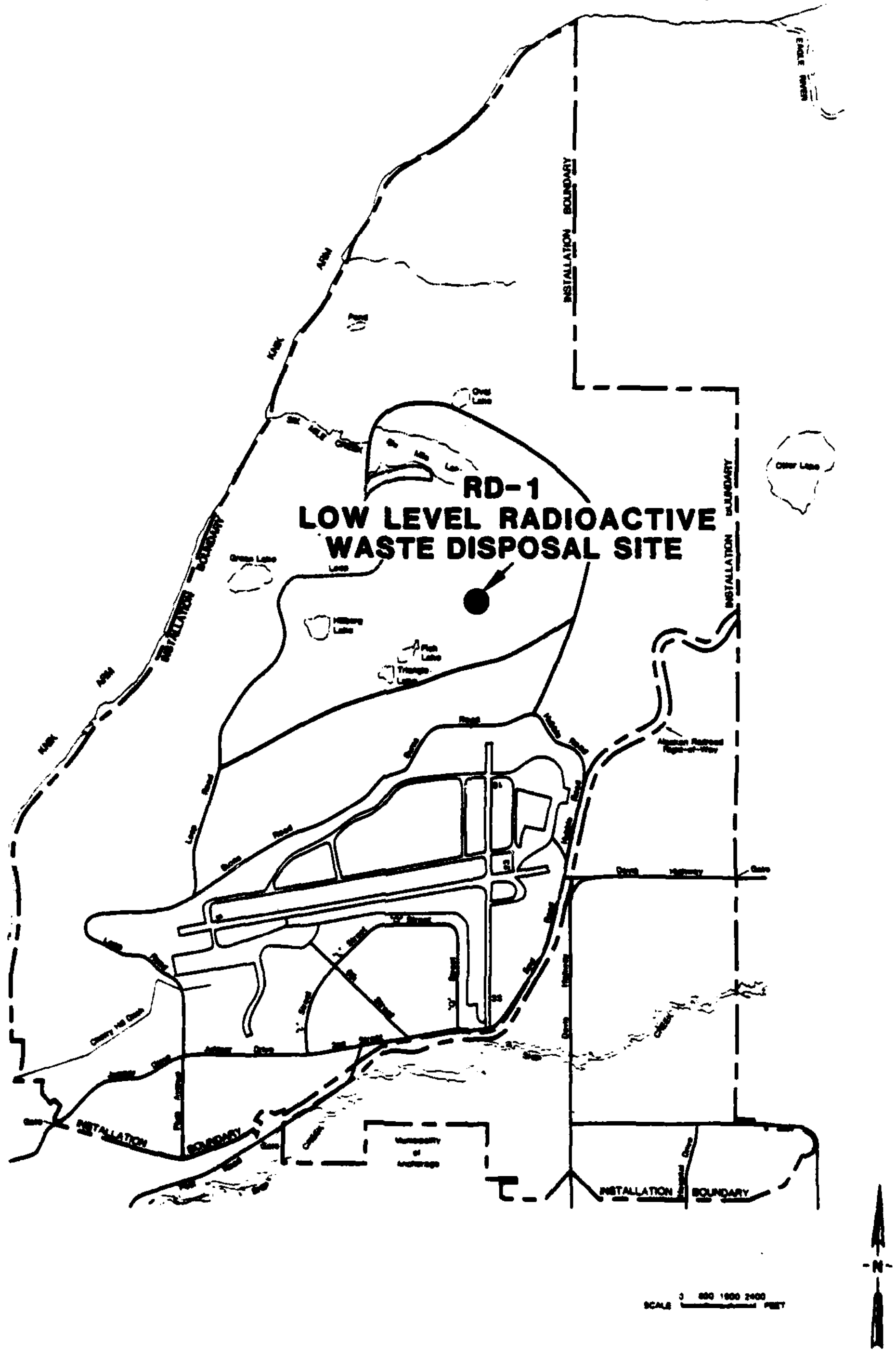
Sanitary Sewer System

Domestic sewage at Elmendorf AFB is disposed of through the Greater Anchorage Area Borough sewage disposal facilities. Prior to use of the public sewage system in Anchorage, sanitary wastes were discharged through the sewer system directly to Knik Arm. In a small aerated

FIGURE 4.5

ELMENDORF AFB

LOW-LEVEL RADIOACTIVE WASTE DISPOSAL SITE



SOURCE: ELMENDORF AFB INSTALLATION DOCUMENTS

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lagoon was used near Building 41-750 to treat domestic wastes generated by the 6981st Electronics Security Squadron. These areas pose no potential for environmental contamination.

Oil/Water Separators

Three oil/water separators presently exist at Elmendorf AFB:

Location	Building Use
32-141	Heavy Equipment Shop
32-179	Hangar 6
32-209	Hangar 7
11-290	AGE Maintenance

The recovered oil from each separator is disposed of by a contractor and the majority of wastewater enters the sanitary sewer system. Based on an on-site survey, these units should not pose a potential ground-water contamination hazard due to overflow or past operational problems.

Storm Drainage System

Most of the industrial area and flightline are drained by a storm water system which discharges to Cook Inlet. One storm line serving a portion of the N-S runway, Taxiway 3 and Q Street ultimately drains to Ship Creek after being discharged to a swampy area south of the railroad tracks. No known problems exist other than those identified in the industrial shops and fuels management sections.

EVALUATION OF PAST DISPOSAL ACTIVITIES AND FACILITIES

The review of past operation and maintenance functions and past waste management practices at Elmendorf AFB has resulted in the identification of sites initially considered as areas of concern with regard to their potential for contamination and migration of contaminants. These sites were evaluated using the Decision Tree Methodology illustrated in Figure 1.1. Those sites which were not considered to have the potential for contamination were deleted from further consideration. Those sites which were considered as having a potential for contamination, as well as a potential for the migration of contaminants, were further evaluated using the Hazard Assessment Rating Methodology (HARM). Table 4.6 identifies the Decision Tree logic questions used for each of the areas of initial concern.

Based on the Decision Tree logic, 19 of the sites originally reviewed were not considered to warrant further evaluation using the Hazard Assessment Rating Methodology. The rationale for omitting these sites from HARM evaluation is described below.

- o Disposal Sites D-1, D-2, D-3, D-4, D-6, D-8, D-9, D-10, D-11, D-12....Inert nature of materials deposited at these sites.

- o Spill Sites SP-1, SP-3, SP-8, SP-12, SP-16....Spilled materials contained and cleaned up.

- o Low-Level Radioactive Waste Disposal Site RD-1....Materials excavated and disposed of off-site.

- o Storage Sites S-1, S-3, S-4, S-5....No known spillage of hazardous materials.

The remaining 28 sites identified in Table 4.6 were evaluated using the Hazard Assessment Rating Methodology. The HARM process takes into account characteristics of potential receptors, waste characteristics, pathways for migration, and specific characteristics of the site related to waste management practices. The details of the rating procedures are presented in Appendix G. Results of the assessment for the sites are summarized in Table 4.7. The HARM system is designed to indicate the relative need for follow-on action. The information presented in Table 4.7 is intended to determine priorities for further evaluation of the Elmendorf AFB potentially contaminated areas (Section 5, Conclusions and Section 6, Recommendations). The rating forms for the affected sites at Elmendorf AFB are presented in Appendix H. Photographs of two key sites are included in Appendix F.

TABLE 4.6
SUMMARY OF DECISION TREE LOGIC FOR AREAS OF INITIAL ENVIRONMENTAL CONCERN AT ELMENDORF AFB

Site No.	Site Description	Potential For Contamination	Potential For Contaminant Migration	Potential For Other Environmental Concern	Refer to Base Environmental Programs	HARM Rating
FT-1	Fire Training Area	YES	YES	N/A	N/A	YES
SP-1	Diesel Fuel Line Leak	YES	YES	N/A	N/A	YES
SP-2	JP-4 Fuel Line Leak	YES	YES	N/A	N/A	YES
SP-3	JP-4 Fuel Line Leak	YES	NO	NO	N/A	NO
SP-4	Railroad Maintenance Area Oil Spill	YES	YES	N/A	N/A	YES
SP-5	JP-4 Bulk Storage Tank Spill	YES	YES	N/A	N/A	YES
SP-6	Diesel Fuel Spill	YES	YES	N/A	N/A	YES
SP-7	Pumphouse No. 3 JP-4 Fuel Spill	YES	YES	N/A	N/A	YES
SP-8	Hardstand No. 5 JP-4 Fuel Spill	YES	NO	N/A	N/A	NO
SP-9	C-5 Aircraft Parking Apron JP-4 Spill	YES	YES	N/A	N/A	YES
SP-10	Pumphouse No. 3 JP-4 Fuel Spill	YES	YES	N/A	N/A	YES
SP-11	JP-4 Line Leak	YES	YES	N/A	N/A	YES
SP-12	JP-4 Line Leak	YES	NO	N/A	N/A	NO
SP-13	Diesel Fuel Line Leak	YES	YES	N/A	N/A	YES
SP-14	Mogas Spill	YES	YES	N/A	N/A	YES
SP-15	Avgas Spill	YES	YES	N/A	N/A	YES
SP-16	JP-4 Tank Truck Spill	YES	NO	N/A	N/A	NO
D-1	Landfill (West Overrun)	NO	NO	NO	NO	NO
D-2	Disposal Site	NO	NO	NO	NO	NO
D-3	Landfill	YES	YES	N/A	N/A	YES
D-4	Landfill (Bluff)	YES	YES	N/A	N/A	YES
D-5	Landfill	YES	YES	N/A	N/A	YES
D-6	Construction Rubble Disposal Site	NO	NO	NO	NO	NO
D-7	Landfill	YES	YES	N/A	N/A	YES
D-8	Construction Rubble Disposal Site	NO	NO	NO	NO	NO
D-9	Construction Rubble Disposal Site	NO	NO	NO	NO	NO
D-10	Abandoned Asphalt Drum Dump	YES	NO	YES	YES	NO
D-11	Small Arms Ammunition Disposal Site	NO	NO	NO	NO	NO
D-12	Johnson's Camp Disposal Area	NO	NO	NO	NO	NO
D-13	Disposal Site	YES	YES	N/A	N/A	N/A

TABLE 4.6
(Continued)
SUMMARY OF DECISION TREE LOGIC FOR AREAS OF INITIAL
ENVIRONMENTAL CONCERN AT ELMENDORF AFB

Site No.	Site Description	Potential For Contamination	Potential For Contaminant Migration	Potential For Other Environmental Concern	Refer to Base Environmental Programs	HARM Rating
D-14	Number unused	-	-	-	-	-
D-15	POL Sludge Disposal Site No. 1	YES	YES	N/A	N/A	YES
D-16	POL Sludge Disposal Site No. 2	YES	YES	N/A	N/A	YES
D-17	Shop Waste Disposal Site	YES	YES	N/A	N/A	YES
IS-1	Building 42-400 Floor Drains	YES	YES	N/A	YES	YES
IS-2	Building 42-425 Floor Drains	YES	YES	N/A	YES	YES
IS-3	Building 43-550 Floor Drains	YES	YES	N/A	YES	YES
IS-4	Building 4230 Floor Drains	YES	YES	N/A	YES	YES
IS-5	Building 43-400 Floor Drains	YES	YES	N/A	YES	YES
IS-6	Building 43-450 Floor Drains	YES	YES	N/A	YES	YES
IS-7	Building 21-900 Floor Drains	YES	YES	N/A	YES	YES
IS-8	Building 32-060 Floor Drains	YES	YES	N/A	YES	YES
S-1	Pesticide Storage (Bldg. 22-021)	YES	NO	N/A	NO	NO
S-2	Number Unused	-	-	-	-	
S-3	Old DDT Drum Storage Site	YES	NO	N/A	NO	NO
S-4	Hazardous Waste Storage Area	YES	NO	N/A	NO	NO
S-5	Underground Waste Storage Tank	YES	NO	N/A	YES	NO
S-6	PCB Transformer Storage Area	YES	YES	N/A	N/A	YES
S-7	DPDO Storage Area	YES	NO	N/A	NO	NO
RD-1	Low Level Radioactive Waste Disposal Site	NO	NO	NO	NO	NO

N/A - Not Applicable

TABLE 4.7
SUMMARY OF HARM SCORES FOR POTENTIAL CONTAMINATION SOURCES

Rank	Site Name	Receptor Subscore	Waste Characteristics Subscore	Pathways Subscore	Waste Management Factor	Overall Total Score
1	SP-5 JP-4 Bulk Storage Tank Spill	62	64	80	.95	66
2	D-5 Landfill	46	80	75	.95	64
3	SP-7 Pumphouse No. 3 JP-4 Spill	50	80	67	.95	63
4	SP-10 Pumphouse No. 3 JP-4 Spill	50	80	67	.95	63
5	SP-11 JP-4 Fuel Line Leak	52	64	80	.95	62
6	FT-1 Fire Training Area	48	80	60	.95	60
7	SP-6 Old PCB Transformer Storage Area	67	40	67	1.0	58
8	SP-2 JP-4 Fuel Line Leak	61	48	72	.95	57
9	SP-14 Mogas Spill	52	60	67	.95	57
10	IS-1 Bldg. 42-400 Floor Drains	56	64	60	.45	57
11	D-17 Shop Waste Disposal Site	41	80	67	1.0	56
12	SP-15 Avgas Spill	50	60	67	.95	56
13	D-15 POL Sludge Disposal Site No. 1	66	48	60	.95	55
14	D-7 Landfill	48	54	67	.95	53
15	IS-7 Bldg. 21-900 Floor Drains	60	48	60	.95	53
16	IS-8 Bldg. 32-060 Floor Drains	60	48	60	.95	53
17	IS-2 Bldg. 42-425 Floor Drains	56	48	60	.95	52
18	D-16 POL Sludge Disposal Site No. 2	46	48	60	1.0	51
19	IS-3 Bldg. 43-550 Floor Drains	56	40	52	.95	49
20	IS-4 Bldg. 42-300 Floor Drains	56	40	60	.95	49
21	IS-5 Bldg. 43-410 Floor Drains	56	32	60	.95	47
22	SP-6 Diesel Fuel Spill	61	20	67	.95	47
23	IS-6 Bldg. 43-450 Floor Drains	56	40	60	.95	49
24	SP-1 Diesel Fuel Line Leak	61	16	67	.95	46
25	SP-4 Railroad Maint. Area Oil Seepage	61	20	63	.95	46
26	D-13 Bluff Landfill	46	32	67	.95	46
27	D-4 Disposal Site	63	20	60	.95	46
28	SP-13 Diesel Fuel Line Leak	52	12	67	.95	42
29	D-3 Landfill	56	4	63	.95	39

SECTION 5

CONCLUSIONS

The goal of the IRP Phase I Study is to identify sites where there is the potential for environmental contamination resulting from past waste disposal practices and to assess the probability of contaminant migration from these sites. The conclusions given below are based on assessment of the information collected from the project team's field inspection; review of records and files; review of the environmental setting; and interviews with base personnel, past employees and state and local government employees. Table 5.1 contains a list of the potential contamination sources identified at Elmendorf AFB and a summary of HARM scores for those sites.

SITE SP-5, BULK STORAGE TANK SPILL

Site SP-5, Bulk Storage Tanks (No. 601-604), has been the site of several major spills since the tanks were installed in the early 1940's. In the mid 1960's a 60,000 gallon Avgas spill was recorded. On August 30, 1974, approximately 33,000 gallons of JP-4 fuel were spilled when an underground tank was overfilled. Approximately 16,000 gallons of fuel were recovered. The remainder seeped into the ground at the northwest side of the tank farm.

In the past, fuel seeps have been observed along the bank on the south side of the POL tank farm area. Several areas appeared saturated with fuel during the on-site visit conducted by the project team. These areas are probably a result of seeps occurring on top of the Bootlegger clay formation. Site SP-5 received a HARM score of 66.

SITE D-5 SANITARY LANDFILL

Site D-5, Sanitary Landfill, has a moderate potential for environmental contamination. Trench and fill procedures were used at this site to dispose of general refuse, scrap metal, spent chemicals and other

TABLE 5.1
PRIORITY RANKING OF POTENTIAL CONTAMINATION SOURCES

Rank	Site No.	Site Name	Date of Operation or Occurrence	Overall Total Score
1	SP-5	JP-4 Bulk Storage Tank Spill	Mid 1960's	66
2	D-5	Sanitary Landfill	1951-1973	64
3	SP-7	Pumphouse No. 3 JP-4 Spill	1980	63
4	SP-10	Pumphouse No. 3 JP-4 Spill	1964-1965	63
5	SP-11	JP-4 Line Leak	1978	62
6	FT-1	Fire Training Area	1940-1983	60
7	S-6	Old PCB Transformer Storage Area	1978	58
8	SP-2	JP-4 Line Leak	1964-1965	57
9	SP-14	Mogas Spill	1965	57
10	IS-1	Bldg. 42-400 Floor Drains	1950's-present	57
11	D-17	Shop Waste Disposal Site	1950's-1960's	56
12	SP-15	Avgas Spill	1961	56
13	D-15	POL Sludge Disposal Site No. 1	1964-1968	55
14	D-7	Sanitary Landfill	1965-1983	53
15	IS-7	Bldg. 21-900 Floor Drains	1950's-present	53
16	IS-8	Bldg. 32-060 Floor Drains	1950's-present	53
17	IS-2	Bldg. 42-425 Floor Drains	1950's-present	52
18	D-16	POL Sludge Disposal Site No. 2	1970-1983	51
19	IS-3	Bldg. 43-550 Floor Drains	1950's-present	49
20	IS-4	Bldg. 42-300 Floor Drains	1950's-present	49
21	IS-5	Bldg. 43-410 Floor Drains	1950's-present	49
22	SP-6	Diesel Fuel Spill	1976	47
23	IS-6	Bldg. 43-450 Floor Drains	1950's-present	47
24	SP-1	Diesel Fuel Line Leak	1956-1958	46
25	SP-4	Railroad Maint. Area Seepage	Late 1960's	46
26	D-13	Disposal Site	1967-1971	46
27	D-4	Disposal Site	-	46
28	SP-13	Diesel Fuel Line Leak	1968	42
29	D-3	Sanitary Landfill	1938-1941	39

scrap materials from 1951 to 1973. The trenches were excavated approximately ten feet below grade. The landfill is located in an area whose geology is dominated by the porous characteristics of the gravel till prevalent at Elmendorf AFB.

The majority of the site has been closed and covered with brush, small trees, and grass. However, a small area of the site to the east of the DPDO storage yard is open. Site D-5 received a HARM score of 64.

SITE SP-7, SP-10 PUMPHOUSE NO. 3, JP-4 SPILLS

Pumphouse No. 3 has been the site of two major JP-4 spills in the past, and presents a moderate potential for environmental contamination. During 1964-1965, a 50,000 gallon JP-4 spill occurred at the site. On September 27, 1980, a 36,000 JP-4 spill occurred during refueling of a C-5 aircraft. In both cases almost all of the fuel was unrecovered and seeped into the gravelly soil near the pumphouse. This site received a HARM score of 63.

SITE FT-1, FIRE TRAINING AREA

Site FT-1, Fire Training Area, presents a moderate potential for environmental contamination. Leaking drums of contaminated waste oils, waste solvents, paint thinners and contaminated fuel were stored on-site adjacent to the fire burn area prior to burning them during fire training exercises. The fire training area is situated on a gravel moraine site which is very permeable. The site received a HARM score of 60.

SITE S-6, OLD PCB TRANSFORMER STORAGE AREA

Site S-6, the old ITT PCB transformer storage area presents a moderate potential for contamination. No significant transformer oil leakage is known to exist, however, a large quantity of transformers were stored on the ground at this location in the past and leakage may have occurred.

OTHER SPILL AREAS

Several other spill areas located on the installation present a moderate potential for environmental contamination. These sites are all located in areas of porous gravel till or adjacent to installation surface waters. The sites include:

Site No.	Site Description	HARM Score
SP-11	JP-4 Line Leak	62
SP-2	JP-4 Line Leak	57
SP-14	Mogas Spill	57
IS-1	Building 42-400 Floor Drains	57

SITE D-17, SHOP WASTE DISPOSAL SITE

Site D-17, Shop Waste Disposal Site, has a moderate potential for contamination. During the 1950's and 1960's, liquid waste solvents, paint thinners and waste oils were disposed in a ravine area near the runways. The soil materials at this site are very permeable. The site received a HARM score of 56.

SITE D-7 LANDFILL

Since 1965, Site D-7 has been used for the disposal of base generated general refuse, scrap metal, construction rubble, drums of asphalt, empty pesticide containers and miscellaneous small quantities of shop waste (1960's only). Two gravel pits (30-40' deep) have been operated using area fill methods. One pit was closed in March, 1982, with 2-4' local soil cover. The base is in the process of adding top soil and seeding. The second pit has been used during the past year and is located a few hundred yards northeast of the closed pit. The bottoms of both fill areas are within five feet of the water table. The site is presently monitored via sampling of three monitoring wells located within and adjacent to the closed pit. No contamination is evident based on results of monitoring to date. However, based on water level contour information for the site, the wells are not located in a hydraulically downgradient position with respect to the site. The site received a HARM Score of 53.

LOW POTENTIAL SITES

The remainder of sites listed in Table 5.1 pose a low potential for environmental contamination.

SECTION 6
RECOMMENDATIONS

To aid in the comparison of the twelve sites identified in this study with those sites identified in the IRP at other Air Force Installations, a Hazard Assessment Rating Methodology (HARM) was used for prioritizing IRP Phase II studies. Of primary concern at Elmendorf AFB are those sites with a moderate potential for environmental contamination which are listed in Table 6.1. These sites require further investigation in Phase II. Sites of secondary concern are those with low potential for contaminant migration. No further monitoring is recommended for the other sites with low potential for migration of contaminants unless other data collected indicate a potential problem could exist.

The following recommendatons are made to further assess the potential for environmental contamination from past activities at Elmendorf AFB. The recommended actions are one time sampling and analysis programs to determine if contamination does exist at the site. If contamination is identified the program may require expansion to further define the extent of contamination. The recommended monitoring program for Phase II is summarized in Table 6.1.

PHASE II MONITORING RECOMMENDATIONS

1. Several locations on Elmendorf AFB are considered as moderate potential for contamination as a result of past JP-4 and Avgas spills or line leaks. These sites include:

   a. Site SP-5, Bulk Storage Tank Spill area (Avgas and JP-4)
   b. Pumphouse No. 3, the location of a JP-4 spill in 1980 (Site SP-7) and in 1964-65 (Site SP-10)
   c. Site SP-14 (Mogas spill in 1965)

TABLE 6.1
RECOMMENDED MONITORING PROGRAM FOR PHASE II
Elmendorf Air Force Base

Site	Rating Score	Recommended Monitoring	Remarks
1. SP-5 Bulk Storage Tank Spill	66	Conduct geophysical survey, using EMC and ER. If plume is present install wells and sample.	The survey should be used to locate placement of wells, if necessary.
2. D-5 Sanitary Landfill	64	Conduct geophysical survey using electromagnetic conductivity (EMC) and electrical resistivity (ER). If plume is present, install wells and sample.	The survey should be used to locate placement of wells, if necessary.
3. SP-7 & SP-10 and Pump-house No. 3 Spill Sites	63	Conduct geophysical survey, using EMC and ER. If plume is present install wells and sample.	The survey should be used to locate placement of wells, if necessary.
4. SP-11 JP-4 Line Leak	62	Conduct geophysical survey, using EMC and ER. If plume is present install wells and sample. Obtain sediment samples from small stream and marsh west of site.	The survey should be used to locate placement of wells, if necessary.
5. S-6, PCB Transformer Storage Area	58	Conduct surficial soil sampling and analysis for PCB's at five locations (grid pattern) at former storage site.	If PCB's are detected, additional soil sampling will be required.
6. D-17 Shop Waste Disposal Site	56	Conduct geophysical survey, using EMC and ER. If plume is present, install wells and sample.	The survey should be used to locate placement of wells, if necessary.
7. D-7 Sanitary Landfill	62	Conduct geophysical survey, using EMC and ER. If plume is present install wells and sample. Grout existing wells penetrating the landfill.	The survey should be used to locate placement of wells, if necessary.
8. FT-1 Fire Training Area	57	Conduct geophysical survey, using EMC and ER. If plume is present install wells and sample.	The survey should be used to locate placement of wells, if necessary.
9. SP-2 JP-4 Line Leak	57	Conduct geophysical survey, using EMC and ER. If plume is present install wells and sample.	The survey should be used to locate placement of wells, if necessary.
10. SP-14 MOGAS Spill	57	Conduct geophysical survey, using EMC and ER. If plume is present install wells and sample.	The survey should be used to locate placement of wells, if necessary.
11. Site IS-1 Building 42-400 Floor Drains	57	Conduct geophysical survey, using EMC and ER. If plume is present install wells and sample.	The survey should be used to locate placement of wells, if necessary.
12. Ship Creek	-	Include more parameters (Table 6.2) for analyses in existing sampling program.	Will improve detection capability.
13. Site D-10 Asphalt Drum Storage Area	-	Sample 15-55 gallon drums containing unidentified liquid material to determine nature of wastes stored.	If wastes contained in drums are hazardous adjacent soil sampling may be required.

d. Site SP-2 (JP-4 line leak)

e. Site IS-1 Building 42-400 Floor Drains

At each of these locations it is recommended that a geophysical survey using both electromagnetic conductivity and electrical resistivity methods be conducted. The results of these surveys may be used to detect and delineate a contaminant plume, if present. If a plume is detected, monitoring wells should be installed. The exact number and location of the monitoring wells should be based on the results of the geophysical survey. The wells, once installed, should be sampled for phenols, TOC, oil and grease, pH, and a volatile organics scan.

2. The sanitary landfill (Site D-5) is considered to have a moderate potential for environmental contamination. A geophysical survey should be conducted in the vicinity of the site using both electromagnetic conductivity and electrical resistivity methods. The results of these surveys may be used to delineate the extent of any contaminant plume and aid in determining the proper locations for monitoring wells. If a plume is detected, wells should be installed.

   If necessary, one monitoring well (PVC Schedule 40) should be installed hydraulically upgradient of the site and not less than three monitoring wells should be installed hydraulically downgradient. Monitoring wells will be constructed to an average depth of fifty feet. A ten-foot long mechanically slotted screen should be installed into the zone of saturation, mechanically coupled to forty feet (approximate) of solid wall casing. Each well should be sampled for the parameters listed in Table 6.2.

3. Site SP-11 (JP-4 line leak) is considered to have a moderate potential for environmental contamination. It is recommended that a geophysical survey utilizing both electromagnetic conductivity and electrical resistivity methods be conducted. The

TABLE 6.2
RECOMMENDED LIST OF ANALYTICAL PARAMETERS[(1)]

Total organic carbon
pH[(2)]
Copper (Cu)
Zinc (Zn)
Oil and Grease
Nickel (Ni)
Phenol
PCB
Total dissolved solids[(2)]
Total Organic Halogen [(2)]
Volatile Organic Scan

Arsenic (As)	Lead (Pb)	Endrin	2,4,5-TP Silvex
Barium (Ba)	Mercury (Hg)	Lindane	2,4-D
Cadmium (Cd)	Selenium (Se)	Methoxychlor	Chlordane
Chromium (Cr)	Silver (Ag)	Toxaphene	

(1) All analyses will be conducted in accordance with: "Methods for Analyses of Water and Wastes - Environmental Monitoring and Support Laboratory. Office of Research and Development. USEPA. EPA 600/4-78-020. March, 1979.

(2) These analyses will not be performed on soil or sediment analyses.

results of these surveys may be utilized to detect and delineate a contaminant plume and aid in the determination of proper monitoring well locations. If a plume is detected, monitoring wells should be installed. The exact locations and number of monitoring wells should be based on results of the geophysical survey.

In addition to the above, sediment samples should be obtained at not less than three points along the small westward flowing stream located immediately north of the site. Three representative sediment samples should also be obtained from the marsh area located approximately 600 feet west of the site. The actual sampling locations must be determined in the field in order to obtain the most representative samples. All sediment samples should be analyzed for oil & grease, lead and phenols.

4. The former shop waste disposal site (Site D-17) is considered to have a moderate potential for environmental contamination. It is recommended that a geophysical survey utilizing both electromagnetic conductivity and electrical resistivity methods be conducted. The results of these surveys may be utilized to detect and delineate a contaminant plume and aid in the determination of proper monitoring well locations. If a plume is detected, monitoring wells should be installed.

   One monitoring well (Schedule 40 PVC) should be installed hydraulically upgradient of the site and not less than three wells (Schedule 40 PVC) should be installed hydraulically downgradient of the site. Monitoring wells will be constructed to an average maximum depth of fifty feet. A ten-foot mechanically slotted screen should be installed into the zone of saturation, mechanically coupled to forty feet (approximate) of solid wall casing. Each well should be sampled for the parameters listed in Table 6.2.

5. The closed landfill cell at Site D-7 is considered to have a moderate potential for environmental contamination. Although monitoring wells were installed under an earlier study (Zenone and Anderson, 1974), the original wells have been found to be incorrectly installed in accordance with present day state-of-the-art and improperly located, based upon the ground-water flow directions postulated by the USGS work. For those reasons, it is recommended that a geophysical survey utilizing both electromagnetic conductivity and electrical resistivity methods be conducted. The results of these surveys may be utilized to detect and delineate a contaminant plume and aid in the determination of proper monitoring well locations. If a plume is detected, monitoring wells should be installed.

   One monitoring well (Schedule 40 PVC) should be installed hydraulically upgradient of the site and not less than three wells (Schedule 40 PVC) should be installed hydraulically downgradient of the site. Monitoring wells will be constructed to an average maximum depth of fifty feet. A ten-foot mechanically slotted screen should be installed into the zone of saturation, mechanically coupled to forty feet (approximate) of solid wall casing. Each well should be sampled for the parameters listed in Table 6.2.

   The existing monitoring wells (ESL-1 and ESL-2), penetrating the landfill site, should be sealed with expansive grout to prevent their possible conductance of leachate into the shallow aquifer system, should they be permitting the leakage of contaminants from the landfill above.

6. The fire training area (Site FT-1) has a moderate potential for environmental contamination. It is recommended that a geophysical survey utilizing both electromagnetic conductivity and electrical resistivity methods be conducted. The results of these surveys may be utilized to detect and delineate a contaminant plume and aid in the determination of proper monitoring well

locations. If a plume is detected, monitoring wells should be installed. The exact number and location of wells should be determined upon review of the geophysical survey data.

7. Ship Creek surface water monitoring should be upgraded in order to determine if this important water resource is being impacted by past or present on-installation or off-installation activities. In order to accomplish this, it is recommended that the existing sampling program be upgraded (for one year) to include all the parameters listed in Table 6.2.

OTHER RECOMMENDATIONS

1. A survey of the old hanger facilities should be conducted to determine which floor drains are connected to the sanitary sewer and which are connected to dry wells.

RECOMMENDED GUIDELINES FOR LAND-USE RESTRICTIONS

It is recommended that land use restrictions at the identified disposal and spill sites at Elmendorf AFB be considered. The purpose of such land use restrictions would be: (1) to provide the continued protection of human health, welfare, and the environment; (2) to insure that the migration of potential contaminants is not promoted through improper land uses; (3) to facilitate the compatible development of future USAF facilities; and (4) to allow for identification of property which may be proposed for excess or outlease.

The recommended guidelines for land use restrictions at each of the identified disposal and spill sites at Elmendorf AFB are presented in Table 6.3. A description of the land use restriction guidelines is presented in Table 6.4. Land use restrictions at sites recommended for Phase II monitoring should be reevaluated upon the completion of Phase II monitoring program and changes made where appropriate.

TABLE 6.3
RECOMMENDED GUIDELINES FOR FUTURE LAND USE RESTRICTIONS AT POTENTIAL CONTAMINATION SITES

Site Name	Recommended Guidelines for Future Land Use Restrictions											
	Construction on the site	Excavation	Well construction on or near the site	Agricultural use	Silvicultural use	Water infiltration (Run-on, ponding, irrigation)	Recreational use	Burning or ignition source	Disposal operations	Vehicular traffic	Material storage	Housing on or near the site
D-5, Sanitary Landfill	x	x	x	x		x	x	x	x	x		x
D-17, Shop Waste Site	x	x	x	x		x	x	x	x		x	x
D-7, Sanitary Landfill	x	x	x	x		x	x	x	x	x		x
SP-7 and SP-10, JP-4 Spills		x	x	x			x	x	x			x
SP-5, JP-4 Spill		x	x	x			x	x	x			x
SP-12, JP-4 Line Leak		x	x	x			x	x	x			x
SP-11, JP-4 Line Leak		x	x	x			x	x	x			x
FT-1, Fire Training Area	x	x	x	x		x	x	x	x			x
SP-2, JP-4 Line Leak		x	x	x			x	x	x			x
SP-14, MOGAS Spill		x	x	x			x	x	x			x
IS-1, Building 42-400 Floor Drains		x	x	x			x	x	x			x

TABLE 6.4
DESCRIPTION OF GUIDELINES FOR LAND-USE RESTRICTIONS

Guideline	Description
Construction on the site	Restrict the construction of structures which make permanent (or semi-permanent) and exclusive use of a portion of the site's surface.
Excavation	Restrict the disturbance of the cover or subsurface materials.
Well construction on or near the site	Restrict the placement of any wells (except for monitoring purposes) on or within a reasonably safe distance of the site. This distance will vary from site to site, based on prevailing soil conditions and ground-water flow.
Agricultural use	Restrict the use of the site for agricultural purposes to prevent food chain contamination.
Silvicultural use	Restrict the use of the site for silvicultural uses (root structures could disturb cover or subsurface materials).
Water infiltration	Restrict water run-on, ponding and/or irrigation of the site. Water infiltration could produce contaminated leachate.
Recreational use	Restrict the use of the site for recreational purposes.
Burning or ignition sources	Restrict any and all unnecessary sources of ignition, due to the possible presence of flammable compounds.
Disposal operations	Restrict the use of the site for waste disposal operations, whether above or below ground.
Vehicular traffic	Restrict the passage of unnecessary vehicular traffic on the site due to the presence of explosive material(s) and/or of an unstable surface.
Material storage	Restrict the storage of any and all liquid or solid materials on the site.
Housing on or near the site	Restrict the use of housing structures on or within a reasonably safe distance of the site.

APPENDIX A

PROJECT TEAM QUALIFICATIONS

J.R. Absalon, C.P.G.
W.G. Christopher, P.E.
M.I. Spiegel

10.22

Biographical Data

JOHN R. ABSALON
Hydrogeologist

PII Redacted

[redacted]

Education
B.S. in Geology, 1973, Upsala College, East Orange, New Jersey

Professional Affiliations
Certified Professional Geologist (Indiana No. 46)
Association of Engineering Geologists
Geological Society of America
National Water Well Association

Experience Record

1973-1974 Soil Testing Incorporated-Drilling Contractors, Seymour, Connecticut. Geologist. Responsible for the planning and supervision of subsurface investigations supporting geotechnical, ground-water contamination, and mineral exploitation studies in the New England area. Also managed the office staff, drillers, and the maintenance shop.

1974-1975 William F. Loftus and Associates, Englewood Cliffs, New Jersey. Engineering Geologist. Responsible for planning and management of geotechnical investigations in the northeastern U.S. and Illinois. Other duties included formal report preparation.

1975-1978 U.S. Army Environmental Hygiene Agency, Fort McPherson, Georgia. Geologist. Responsible for performance of solid waste disposal facility siting studies, non-complying waste disposal site assessments, and ground-water monitoring programs at military installations in the southeastern U.S., Texas, and Oklahoma. Also responsible for operation and management of the soil mechanics laboratory.

1978-1980 Law Engineering Testing Company, Atlanta, Georgia. Engineering Geologist/Hydrogeologist. Responsible for the project supervision of waste management, water quality assessment, geotechnical, and hydrogeologic studies at commercial, industrial, and government

10.22
John R. Absalon (Continued)

facilities. General experience included planning and management of several ground-water monitoring programs, development of remedial action programs, and formulation of waste disposal facility liner system design recommendations. Performed detailed ground-water quality investigations at an Air Force installation in Georgia, a paper mill in southwestern Georgia, and industrial facilities in Tennessee.

1980-Date Engineering-Science. Hydrogeologist. Responsible for supervising efforts in waste management, solid waste disposal, ground-water contamination assessment, leachate generation, and geotechnical and hydrogeologic investigations for clients in the industrial and governmental sectors. Performed geologic investigations at twelve Air Force bases and other industrial sites to evaluate the potential for migration of hazardous materials from past waste disposal practices. Conducted RCRA ground-water monitoring studies for industrial clients and evaluated remedial action alternatives for a county landfill in Florida. Conducted quality management, hydrogeologic and ground-water quality programs for the pulp and paper industry at several mills located in the Southeast United States.

Publications and Presentations

"An Investigation of the Brunswick Formation at Roseland, NJ," 1973, with others, The Bulletin, Vol 18, No. 1, NJ Academy of Science, Trenton, NJ.

"Engineering Geology of Fort Bliss, Texas," 1978, coauthor: R. Barksdale, in Terrain Analysis of Fort Bliss, Texas, US Army Topographic Laboratory, Fort Belvoir, VA.

"Geologic Aspects of Waste Disposal Site Evaluations," 1980, with others, Program and Abstracts AEG-ASCE Symposium on Hazardous Waste Disposal, April 26, Raleigh, NC.

"Practical Aspects of Ground-Water Monitoring at Existing Disposal Sites," 1980, coauthor: R.C. Starr, Proceedings of the EPA National Conference on Management of Uncontrolled Hazardous Sites, HMCRI, Silver Spring, MD.

"Improving the Reliability of Ground-Water Monitoring Systems," 1981, Proceedings of the Madison Conference of Applied Research and Practice on Municipal and Industrial Waste, University of Wisconsin-Extension, Madison, WI.

10.22
John R. Absalon (Continued)

Ground-Water Monitoring Workshop, 1982. Presented to Mississippi Bureau of Pollution Control, Jackson, 15-17 February.

Ground-Water Monitoring Workshop, 1982. Presented to Alabama Division of Solid and Hazardous Waste, Huntsville, 20-21 July.

Ground-Water Monitoring Workshop, 1982. Presented to Kentucky Waste Management Division, Bowling Green, 27-28 July.

"Identification and Treatment Alternatives Evaluation for Contaminated Ground Water," 1982, coauthor: M. R. Hockenbury. Presented to Association of Engineering Geologists Symposium on Hazardous Waste Disposal, Atlanta, 17 September.

"Preliminary Assessment of Past Waste Storage and Disposal Sites," 1982, coauthor: W. G. Christopher. Presented to Association of Engineering Geologists Symposium on Hazardous Waste Disposal, Atlanta, 17 September.

"Treatment Alternatives Evaluation for Aquifer Restoration," 1983, coauthor: M. R. Hockenbury, Proceedings of the Third National Symposium on Aquifer Restoration and Ground Water Monitoring, NWWA, Worthington, OH.

Biographical Data

WILLIAM GARY CHRISTOPHER

Environmental Engineer

PII Redacted

[redacted]

Education

B.S.C.E. in Civil Engineering, (Magna Cum Laude), 1974
West Virginia University, Morgantown, W.Va.
M.E. in Environmental Engineering, 1975, University of Florida, Gainesville, Florida

Professional Affiliations

Registered Professional Engineer (Georgia No. 11886)
American Society of Civil Engineers (Associate Member)
West Virginia Water Pollution Control Federation

Honorary Affilitations

Chi Epsilon
Tau Beta Pi
EPA Traineeship for Master's Degree

Experience Record

1972-1974 West Virginia Department of Highways. Morgantown, West Virginia. Highway Co-op Technician. Handled inspection of drainage, concrete structures, earthwork and compaction testing for interstate highway construction within Monongalia County and Preston County. Performed field office assignments to finalize estimates and quantities for a completed section of highway construction.

1975-1977 Union Carbide Corporation, Chemicals and Plastics Division, Environomental Engineering Department. As a process/project engineer performed environmental protection engineering for Union Carbide's Taft and Texas City Plants. Projects included process design of a rapid mix-flocculation basin for the Gulf Coast Waste

William Gary Christopher (Continued)

Disposal Authority (GCWDA) 40-Acre Facility Treatment Plant. Performed bench-scale studies of coagulant use to improve settling of aeration basin effluent biosolids at the 40-acre facility. Predicted 40-acre facility effluent BOD and effluent TSS quality following operation changes to the existing facility including addition of a limited aeration basin to the front end of the treatment plant. Performed process feasibility and conceptual design of an aeration treatment facility for Union Carbide's Texas City plant concentrated waste stream. Performed preliminary process scope and cost appraisals for sludge disposal alternatives at Texas City including: landfarming, pressure filtration-landfill and pressure filtration-incineration. Performed settling column studies for solvent vinyl resin and suspension vinyl resin waste streams and sized settling basins from the studies. Proposed bench-scale study of the effect of ethyleneamines waste stream on anaerobic treatment of Texas City concentrated wastes. Provided review assistance for a 200-acre regional industrial landfill, in-place stabilization processes for 18-acre lagoons of primary sludge and pyrolysis fuel oil mixtures at Texas City, and source reduction projects. Evaluated at UNOX compressor piping modification for the Taft Plant to reduce power consumption by 50%. Wrote preliminary operational considerations for a proposed GCWDA regional landfarm.

1977-Date Engineering-Science, Inc. Project Engineer on study for the American Textile Manufacturers Institute and EPA. Responsible for field pilot plant study and evaluation of coagulation/clarification/multi-media filtration, carbon adsorption, ozonation, coagulation/multi-media filtration and dissolved air flotation technologies for treatment of textile industry "BPT" effluents to meet future BATEA guidelines. An ancillary portion of this project included review of existing activated sludge facilities and operational practices to meet current "BPT" limits at 5 textile mill sites.

Project engineer on study for Lederle Laboratories, Pearl River, New York plant. Responsible for wastewater treatment plant evaluation and optimization study with particular emphasis on operational changes to improve performance. Treatment processes included coagulation, flocculation, primary sedimentation, oxygen activiated sludge and final sedimentation.

William Gary Christopher (Continued)

Project manager of waste treatment operations evaluation at a pharmaceutical plant. Responsibilities included operational optimization of the full-scale activated sludge process with full-scale coagulation testing, bench-scale bioreactor studies and equalization mixing and capacity studies.

Project engineer on study to determine the impact of RCRA regulations on the coal-fired utility industry. Assisted in development of design criteria and cost methodology and estimates to compare the cost impact of RCRA 3004 and 4004 regulations on fly ash, bottom ash and FGD sludge disposal on a regional and nationwide basis.

Project Manager for review of a Permit Application and design for a proposed Hazardous Waste Disposal Facility in North Carolina.

Project Manager for preparation of a "white paper" for the Department of Energy to assess major impacts of proposed RCRA 3001, 3004 and 3006 regulations on industrial coal use for power generation.

Project Manager on study to determine biotreatability of new process wastes for a pharmaceutical chemical plant and to evaluate and define options for liquid waste incineration.

Project Manager on odor control study of process wastes for a major organic chemicals company. Responsible for laboratory bench-scale and field pilot plant study involving evaluation of liquid waste, air and steam stripping, chemical oxidation, ozonation, and activated carbon adsorption. Design criteria for a biological treatment system for the odor pretreatment effluent was also developed from bench-scale bioreactor studies.

Project Manager on a study to provide a preliminary evaluation of advanced waste treatment technologies required for upgrading an existing activated sludge facility treating organic chemical and pharmaceutical wastes with high COD and nitrogenous concentrations.

Project Manager on a biological treatability study to provide expanded waste treatment facilities for a major organic chemicals firm. Responsibilities included laboratory bench-scale and pilot scale treatability and sludge handling studies involving waste characterization, activated sludge treatability, aerobic digestion, gravity thickening, dissolved air flotation, belt filter press sludge dewatering, plate and frame pressure

William Gary Christopher (Continued)

filter, vacuum filter (rotary precoat), and centrifugation for nine different raw waste streams.

Project Manager for a project involving process selection and preliminary engineering design for a pulp and paper mill waste treatment facility.

Project Manager on Solid and Hazardous Waste study for a diverse chemicals and plastics production facility. Responsibilities included RCRA Interim Status Compliance, RCRA Manifest Implementation and plant training, RCRA Notification and Permit Part A applications. Detailed Solid Waste inventories by production unit and classification of wastes according to RCRA were developed. Segregation of wastes, recycle/recovery and ultimate disposal options including incineration and secure landfills were evaluated for the short-term. Long-term evaluations will be considered in Phase II of the Study.

Project Manager on Solid and Hazardous Waste study for a diverse organic chemicals manufacturing facility. Long-term alternatives for storage, handling, treatment and disposal of a variety of types of hazardous wastes were evaluated based on technical performance and economic comparisons. Alternatives evaluated included solid and liquid incineration, landfill, landfarm, solidification/fixation, and physical volume reduction (shredding,compaction). Developed a detailed Spill Control and Best Management Practices Manual.

Project Manager for a waste treatment plant capacity evaluation for a silicon wafer manufacturing facility. Bench-scale and pilot scale coagulation and settling column studies were performed in addition to field scale oxygen transfer tests to predict maximum design organic and hydraulic loadings for an existing activated sludge waste treatment facility.

Project manager for a biological treatability study to determine the optimum conditions (temperature and hydraulic residence time) for removal of a specific organic currently produced at a chemical production facility.

Project manager for nine Installation Restoration Programs (IRP) Phase I projects for the U.S. Air Force (Kelly AFB, Eglin AFB, Duluth AFB, Hancock AFB, DESC, England AFB, Lowry AFB, Elmendorf AFB, Dover AFB). Each of these projects utilized a project team of various disciplines (geology, chemical engineering,

William Gary Christopher (Continued)

biology, environmental engineering) to assess the potential for environmental contamination migration resulting from past hazardous waste handling, storage, treatment and disposal practices. The project tasks included environmental audits, development of waste inventories and waste classification, assessment of site environmental setting, assessment of past waste handling practices (surface impoundments, landfills, storage areas, fire training areas) and finally priority ranking of sites and recommendations for Phase II groundwater monitoring programs.

Project manager for development of an environmental audit manual for a pharmaceutical/food processing industry client. Audit areas included: air, drinking water, hazardous waste, infectious waste, non-hazardous waste, radioactive waste, spill control, superfund, toxic substances, wells, and wastewater.

Project manager for a preliminary design for upgrading an existing activated sludge facility (175,000 gpd) to accommodate expanded pharmaceutical and chemical production facilities. The modifications included provisions for additional submerged aeration capacity, solids contact clarification and mixed equalization.

Technical Publications

"Magnesium Recovery from a Neutral Sulfite Semi-chemical Pulp and Paper Mill Sludge," Master of Engineering Research Project, University of Florida, Gainesville, Florida 1975.

"Siting Considerations for Hazardous Waste Disposal Facilities," presented at the Georgia Environmental Health Association Conference, Jekyll Island, Georgia, July, 1981. (Co-author T.N. Sargent)

"Hazardous Waste Management," Seminar presented to Capitol Associated Industries, Inc., Raleigh, North Carolina, August 21, 1981

"Ground-Water Monitoring" Seminar and Workshop presented to the State of Mississippi, Bureau of Pollution Control, Jackson, Mississippi, February 16-17, 1982. (Co-presentors - J. R. Absalon, E.J. Schroeder).

"Ground-Water Monitoring and Sampling" Seminar and Workshop presented to the State of Alabama, Huntsville, Alabama, July 20-21, 1982. (Co-presentors - J. R. Absalon, R. E. McLeod).

William Gary Christopher (Continued)

"Ground-Water Monitoring and Sampling" Seminar and Workshop presented to the State of Kentucky. Bowling Green, Kentucky, July 27-28, 1982. (Co-presentors - J. R. Absalon, R. E. McLeod).

"Preliminary Assessment of Past Hazardous Waste Storage, Treatment and Disposal Sites" presented to the Association of Engineering Geologists, Atlanta, Georgia, September 17, 1982.

"Contaminated Ground Water and Surface Water Treatment at Uncontrolled Hazardous Waste Sites" presented to the 12th Annual Conference on Waste Technology NSWMA. Memphis, Tennessee, October 15, 1983.

"Assessment and Cleanup of Hazardous Waste Sites", Seminar presented at Clemson University, April 14, 1983.

Biographical Data

MARK I. SPIEGEL

PII Redacted

Environmental Scientist

[redacted]

Education

B.S. in Environmental Health Science (Magna cum laude), 1976, University of Georgia, Athens, Georgia
Limnology and Environmental Biology, University of Florida, Gainesville, Florida
MBA Candidate, Marketing, Georgia State University

Professional Affiliations

American Water Resources Association
Technical Association of the Pulp and Paper Industry

Experience Record

1974-1976 U.S. Environmental Protection Agency, Surveillance and Analysis Division. Cooperative Student. On assignment to Air Surveillance Branch, participated in ambient air study in Natchez, Mississippi, and operated unleaded fuel sampling program for Southeast National Air Surveillance Network. For Engineering Branch, participated in NPDES compliance monitoring of industrial facilities throughout the southeast; operation and maintenance studies of municipal waste treatment facilities; and post-impoundment study of West Point Reservoir, West Point, Georgia. Participated in industrial bioassay studies for the Ecological Branch.

1977-Date Engineering-Science. Environmental Scientist. Responsible for the conduct of water and wastewater sampling programs and analyses, quality control, laboratory process evaluations, and evaluation of other environmental assessment data. Conducted leachate extraction studies of sludges produced at a large organic chemicals plant to define nature of sludges according to the Resource Recovery and Conservation Act Guidelines. Involved in laboratory quality assurance program for the analysis of water samples used in a stream modeling project. Conducted a water quality modeling study for Amerada Hess Corporation to determine the assimilative capacity of

Mark I. Spiegel (Continued)

a stream receiving effluent from a southern Mississippi refinery.

Developed an Environmental Audit Manual for a pharmaceutical company. The purpose of the audit manual was to aid the company in identifying areas where a particular facility may not comply with Federal and state environmental regulations.

Prepared a Guidance Manual for the preparation of uniformly formated spill control plans for the U. S. Air Force. A exemplary spill plan was prepared for a specific Air Force base using the format designed in the Guidance Manual.

Participated as project team member for Phase I Installation Restoration Program projects for the Department of Defense. Studies were conducted at twelve Air Force bases to identify past hazardous waste disposal practices that could result in migration of contaminants and to recommend priority sites requiring further investigation.

Participated in bench-scale industrial treatability studies conducted for the American Textile Manufacturers Institute and Eli Lilly Pharmaceuticals in Mayaguez, Puerto Rico, and in carbon adsorption studies for an American Cyanamid chemical plant and Union Carbide Agricultural Products Division.

Involved in various aspects of several industrial environmental impact assessments including preliminary planning for a comprehensive study for St. Regis Paper Company on a major pulp and paper mill expansion project. Assisted in preparation of third-party EIS for EPA and Mobil Chemical Company concerning a proposed 16,000-acre phosphate mining and beneficiation facility. Developed an EIA prior to construction of a pulp and paper complex by the Weyerhaeuser Company in Columbus, Mississippi, which included preparation of a separate document for the Interstate Commerce Commission concerning the construction of a railroad spur to serve the complex. Also involved in formulating the water quality, water resource and socio-economic aspects of an environmental impact assessment for International Paper Company. Participated in large scale site evaluation to determine the suitability and environmental permitting requirements of a site for an east coast brewery for the Adolph Coors Company. Participated in a study to evaluate various options for developing

Mark I. Spiegel (Continued)

a large parcel of land in the coastal section of North Carolina. The study involved evaluating both the market potential and environmental constraints of various options for development such as timber harvesting, peat mining, corporate farming and aquaculture (catfish farming).

Project Manager. Conducted comprehensive process evaluation of an 80 mgd wastewater treatment system for Weyerhaeuser Company. Responsible for a study to determine the leaching characteristics of sludges for a paint manufacturing facility for RCRA compliance. Also managed study for development of a solid waste management plan for a ceramic pottery manufacturer in northern Alabama which included evaluating surface and ground-water contamination potential from the existing disposal site and assisting manufacturer in developing a disposal program acceptable to state agencies.

APPENDIX B

LIST OF INTERVIEWEES

APPENDIX B
LIST OF INTERVIEWEES

	Position	Period of Service
I.	Present and Past Base Employees Interviewed	
1.	Environmental Coordinator/21 CES	1972-present
2.	Assistant Environmental Coordinator/21 CES	1981-present
3.	Bioenvironmental Engineer/USAF Hosp.	1980-present
4.	Associate Chief of Bioenvironmental Engineering/USAF Hosp.	1981-present
5.	Landfill Operator/21 CES	1966-1973
6.	Deputy Chief Operations Branch/21 CES	1954-present
7.	AGE Branch-Crew Supervisor/21 EMS	1970-present
8.	AGE Branch-Branch Chief/21 EMS	1958-present
9.	Chief of Operations/21 CES	1979-present
10.	Fuel Cell Repair-NCOIC/21 EMS	1981-present
11.	Repair and Reclamation Shop A/21 EMS	1979-present
12.	Tire Shop Foreman/21 EMS	1958-present
13.	Paint Shop Foreman/21 EMS	1955-present
14.	Missile Maintenance NCOIC/21 EMS	1982-present
15.	PMEL-Branch Chief/21 CRS	1980-present
16.	Propulsion Branch-NCOIC/21 CRS	1980-present
17.	Metal Processing-NCOIC/21 CRS	1982-present
18.	Supervisor Power Plant/21 CES	1954-present
19.	Structural Repair-NCOIC/21 CRS	1981-present
20.	Machine Shop Supervisor/21 CRS	1973-present
21.	NDI Lab NCOIC/21 CRS	1981-present
22.	Pneudralics Shop/21 CRS	1980-present
23.	Battery Shop Foreman/21 CRS	1972-present
24.	Environmental Control Systems Asst. NCOIC/21 CRS	1983-present
25.	21 AMV-OIC/21 AGS	1981-present
26.	43 AMU-OIC/21 AGS	1982-present
27.	Fuel Laboratory-NCOIC/21 SUP	1983-present
28.	Cryogenics/21 SUP	1980-present
29.	Chief Materials Storage and Distribution/21 SUP	1980-present
30.	Chief Industrial Shops/5099 CEOS	1979-present
31.	Diesel Maintenance Supervisor/5099 CEOS	1969-present
32.	Structures Superintendent/21 CRS	1972-1979, 1982-present
33.	Paint Shop Foreman/21 CES	1971-present
34.	Welding Shop Foreman/21 CES	1981-present
35.	Plumbing Shop Foreman/21 CES	1981-present
36.	Interior-Exterior Electrics/21 CES	1981-present
37.	Boiler Facilities Lab Supervisor/21 CES	1982-present
38.	Photo Lab NCOIC/Det. 5, 1369th AVS	1981-present
39.	Armament Recording Lab/Det. 5, 1369th AVS	1980-present
40.	Refueling Maintenance Supervisor/21 Trans	1983-present
41.	Crash and Fire Equipment Maintenance-NCOIC/21 Trans	1980-present

APPENDIX B

LIST OF INTERVIEWEES (Cont'd.)

	Position	Period of Service
42.	Bioenvironmental Engineer (retired)/USAF Hosp.	1974-1981
43.	Heavy Equipment Shop Foreman/21 Trans	1947-present
44.	Vehicle Maintenance-NCOIC/21 Trans	1980-present
45.	Vehicle Maintenance Tire Shop Foreman/21 Trans	1982-present
46.	Flightline Maintenance Chief/616 Cams	1982-present
47.	Maintenance Supervisor/21 CRS	1962-present
48.	Refurbishment Shop/611 CAMS	1976-1979, 1982-present
49.	AGE Shop-NCOIC/616 CAMS	1982-present
50.	Aerospace Systems-NCOIC/616 CAMS	1979-present
51.	Helicopter Section/616 CAMS	1980-present
52.	Accessory Maintenance Branch Chief/21 CRS	1964-present
53.	Pavement and Grounds Supervisor/21 CES	1980-present
54.	Propulsion Shop-NCOIC/616 CAMS	1981-present
55.	Flight Simulator-NCOIC/21 CRS	1981-present
56.	Dental Clinic-NCOIC/USAF Hosp.	1981-present
57.	Medical Lab-NCOIC/USAF Hosp.	1980-present
58.	X-Ray Lab-NCOIC/USAF Hosp.	1979-present
59.	Maintenance Supervisor/6981 ESS	1981-present
60.	Hobby Shop Supervisor/21 CSG	1981-present
61.	Aero Club Mechanic/21 CSG	1981-present
62.	Retired Metal Processing Shop Supr./21 EMS	1946-1973
63.	Retired Aircraft Maintenance Supt./21 EMS	1942-1977
64.	Environmental Support Foreman/21 CES	1950-present
65.	Deputy Chief of Operations/21 CES	1964-present
66.	Deputy BCE/21 CES	1941-1981
67.	Fire Chief/21 CES	1981-present
68.	Assistant Fire Chief/21 CES	1968-present
69.	Superintendent of Sanitation/21 CES	1947-1973
70.	Fuels Management-NCOIC/21 SUP	1980-present
71.	Pavement and Grounds/21 CES	1980-present
72.	Heavy Equipment Operator/21 CES	1952-present
73.	Chief Operations Branch/21 CES	
74.	Sanitary Engineer/21 CES	1953-present
75.	Fuels Management/21 SUP	1980-present
76.	Quality Control Inspection NCOIC/21 SUP (Fuels Mgt.).	1964-present
77.	DPDO Chief/DPDO	1982-present
78.	DPDO Warehouse Foreman/DPDO	1946-present
79.	Sanitary Engineer/21 CES	1943-present
80.	AAC Environmental Coordinator/AAC	1981-present
81.	Entomology Shop Supervisor/21 CES	
82.	Real Properties Supervisor/21 CES	
83.	Explosive Ordinance Disposal-NCOIC/21 EMS	1980-present
84.	Command Historian/21 TFW	1973-present
85.	RCA/OMS Incorporated, Project Manager	

APPENDIX B
LIST OF INTERVIEWEES (Cont'd.)

II. Interviews with Outside Agencies and Organizations

George Elliot, Fisheries Biologist
U.S. Fish and Wildlife Service
1011 E. Tudos Road
Anchorage, AK 99503
907/876-3492

Tim Brabets, Hydrologist
U.S. Geological Survey - Water Resources Division
1209 Orca Street
Anchorage, AK 99504
907/271-4153

Bob Stuvek, Southern District Mineral Information Officer
Alaska Division Geological and Geophysical Surveys
3601 C Street, Suite 1008
Anchorage, AK 99510
907/276-2653

Luriza Bankston, Aide
Arctic Environmental Information and
Data Center of the University of Alaska
707 A Street
Anchorage, AK 99501

Dave Mobraten, Lands and Resource Specialist
U.S. Department of Interior, Bureau of Land Management
4700 East 72nd Ave.
Anchorage, AK 99507
907/344-9661

Steve Toruk, Hazardous Waste Coordinator, Alaskan Operations Office
U.S. Environmental Protection Agency
3200 Hospital Drive
Juneau, AK 99801
907/586-7619

Allen Churchill, Hydraulic Engineer, Flood Plain Management Section
U.S. Army Corps of Engineers, Alaskan District
Ponch 898 (Building 21-700, Elmendorf AFB)
Anchorage, AK 99506
907/552-3246

APPENDIX B
LIST OF INTERVIEWEES (Cont'd.)

II. Interviews with Outside Agencies and Organizations, Continued

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Al Sundquist, Engineering Design Supervisor
Anchorage Water and Wastewater Utility
3000 Arctic Boulevard
Anchorage, AK 99503
907/277-7622

Bruce Erickson, Environmental Engineer
Alaska Department of Environmental Conservation
437 E Street, Suite 200
Anchorage, AK 99501
907/274-2533

APPENDIX C

ORGANIZATIONS AND MISSIONS

APPENDIX C

ORGANIZATIONS AND MISSION

PRIMARY ORGANIZATION AND MISSION

The primary mission of the 21st Tactical Fighter Wing is to provide air superiority for Alaska and the North American continent. The Wing is the largest and principal organization within the Alaskan Air Command. The Wing is also responsible for operating Elmendorf AFB and supporting the various tenant units.

TENANT ORGANIZATIONS AND MISSIONS

Elmendorf AFB is the host to several tenant organizations and provides services, facilities and other support to these organizations. The following list identifies the major tenant organizations located at Elmendorf AFB and briefly describes their missions.

Alaskan Air Command (AAC)

The Alaskan Air Command (AAC) has the multifaceted mission of providing early warning of an air attack against the United States and Canada, air sovereignty of U.S. air space and air support for ground forces in Alaska. Headquarters of the AAC are located at Elmendorf AFB.

The AAC commander is also the commander of the North American Air Defense Command (NORAD) Alaskan Region and is responsible to the commander-in-chief, NORAD for aerospace defense of the Alaskan NORAD Region.

A Joint Task Force may be established by the Joint Chiefs of Staff for contingency operations, such as natural disasters, emergencies or hostilities other than aerospace defense. Normally the AAC commander, as senior military officer in Alaska, would be the JTF commander. The JTF commander would control all military forces in Alaska regardless of service.

Additionally, the AAC commander is the coordinating authority for all joint military administrative and logistical matters in Alaska and the military point of contact for the State of Alaska.

The command's personnel are located throughout the state at three main bases, 13 aircraft control and warning (AC&W) squadrons and two air base squadrons.

The Alaskan Air Command also operates the Elmendorf Rescue Coordination Center, better known as the RCC.

The RCC organizes, coordinates and monitors search and rescue efforts for people in distress anywhere in Alaska. The only exceptions are the Aleutian Chain and the southeast panhandle, which are part of the Coast Guard RCC responsibilities.

11th Tactical Control Group

Assigned directly to the Alaskan Air Command, the 11th Tactical Control Group is the single manager for the emerging Alaskan Tactical Air Control System. Additionally, the 11 TCG provides ground control in support of Alaskan Air Command's traditional air sovereignty mission. The group's subordinate units include 13 Aircraft Control and Warning (AC&W) Squadrons located throughout Alaska, and the 3rd Air Support Operations Center flight located on Fort Richardson. Headquartered at Elmendorf, the group also operates the Alaskan NORAD Region Control Center.

Air Force Arctic Broadcasting Squadron (AFABS)

The Air Force Arctic Broadcasting Squadron (AFABS) operates the Alaskan Forces Radio Network and independent television and radio stations in Greenland. The AFABS, a part of the worldwide American Forces Radio and Television Service transmits to the remote sites in Alaska.

AFABS is responsible for keeping personnel assigned to remote Alaskan sites abreast of national and world developments around the clock

11th Weather Squadron

The 11th Weather Squadron provides environmental services in support of all USAF, U.S. Army and National Guard units as well as other specified DOD agencies throughout Alaska. Headquartered at Elmendorf, the squadron has detachments at Elmendorf AFB, Shemya AFB, Eielson AFB and Fort Richardson. Operating locations are found at Galena AFS, King Salmon AFS, and Fort Wainwright. The 11th Weather Squadron provides staff weather support to ASC, the Alaskan NORAD Region, and 616th Military Airlift Group.

616th Military Airlift Group

The Military Airlift Command's 616th Military Airlift Group provides airlift services for the Alaskan theater. The commander of the 616th MAG is also the Commander, Airlift Forces (COMALF). He manages all assigned or attached airlift for the commander of the Alaskan Air Command.

In a dual-hatted role, the COMALF also coordinates inter-theater strategic airlift of C-141s and C-5As for MAC through the 22nd Air Force at Travis AFB, CA. The 616th MAC commander insures the commander of AAC adequate responsive airlift whenever and wherever needed.

The units assigned to the 616th MAG are the 616th Aerial Port Squadron; 616th Consolidated Maintenance Squadron; and the 17th Tactical Airlift Squadron. The 17th TAS has the mission of providing intra-theater airlift for Alaska. This includes remote station support and joint training with U.S. Army forces in Alaska.

71st Aerospace Rescue and Recovery Squadron

The 71st Aerospace Rescue and Recovery Squadron has an inventory of three HC-130 Hercules and seven HH/CH-3E Jolly Green Giant helicopters. The 71st ARRS is tasked with providing search and rescue coverage for the Alaskan theater as well as furnishing helicopter logistic support for the Alaskan Air Command.

6981st Electronic Security Squadron

The 6981st Electronic Security Squadron is subordinate to the Electronic Security Command whose headquarters is at Kelly AFB, Texas. It is an integral part of the worldwide U.S. communications network that provides rapid radio relay of secure communications and command, control and communications countermeasures (C3CM) support to U.S. and allied forces. Unit personnel develop and apply techniques and materials designed to ensure that friendly command and control communications are secure. Additional functions include research into electronic phenomena, direction finding assistance to air-sea rescue and navigational aid. The squadron's antenna is a very prominent landmark on base. It is a large circular antenna array measuring over 100 feet in height, 1,460 feet in diameter, three quarters of a mile in circumference and covering more than 40 acres.

1931st Communications Group

The 1931st Communications Group, part of the world-wide Air Force Communications Command, provides communications and air traffic control services that tie Alaskan military forces into an integrated and highly responsive defense system. Reporting to the Continental Communications Division at Griffiss AFB, N.Y., the 1931st CG maintains nearly all Air Force communications in Alaska. Nowhere else does a single AFCC unit have the range of responsibilities the 1931st CG performs.

Additional Tenants

Detachment 1, 11 Weather Squadron (Military Airlift Command)
Detachment 5, 1369th Audiovisual Sq (Military Airlift Command)
Army & Air Force Exchange Service
Detachment 1422, Air Force Audit Agency
Detachment 919, 3751st Fld Tng Sq (Air Training Command)
Detachment 2010, Air Force Office of Special Investigations
Naval Security Group Activity
Defense Communications Agency, Alaskan Region
Department of Defense Contract Audit Agency
Military Sealift Command Office
National Security Agency, Alaska
Air Force Office of Industrial Relations
U.S. Army Corps of Engineers, Alaska District
U.S.A.F. Hospital, Elmendorf

APPENDIX D

MASTER LIST OF INDUSTRIAL SHOPS

APPENDIX D

MASTER LIST OF INDUSTRIAL SHOPS

Name	Present Location (Bldg. No.)	Handles Hazardous Materials	Generates Hazardous Wastes	Typical T.S.D. Methods
21st Equipment Maintenance SQ (EMS)				
Aerospace Ground Equipment Shop	32-079 32-127	Yes	Yes	DPDO
Egress	43-450	No	No	-
Fuel Cell Repair	42-400	Yes	Yes	Recycle/Fire Training Contaminated w/DPDO
Repair and Reclamation	11-470	Yes	Yes	DPDO
Tire Shop	11-510	Yes	Yes	DPDO
Corrosion Control	32-050	Yes	Yes	DPDO
Missile Maintenance	43-890	No	No	-
Armament	44-510	No	No	-
Munition Material Production	33-324	No	No	-
Munition Inspection	52-140	No	No	-
21st Component Repair SQ (CRS)				
Precision Measurement Instrument Lab (PMEL)	22-064	Yes	Yes	DPDO
Aircrew Training Devices	11-750	Yes	Yes	DPDO
Conventional Avionics	11-120	No	No	-
Integrated Avionics	11-120	No	No	-
Propulsion Shop	11-110	Yes	Yes	DPDO

Name	Present Location (Bldg. No.)	Handles Hazardous Materials	Generates Hazardous Wastes	Typical T.S.D. Methods
21st Component Repair SQ (CRS) continued				
Environmental Control Systems	11-407	No	No	-
Metal Processing	31-420	Yes	Yes	DPDO
Structural Repair	11-570	No	No	-
Machine Shop	11-570	No	No	-
Nondestructive Inspection Lab (NDI)	11-570	Yes	Yes	DPDO
Pneudraulics	11-570	Yes	Yes	DPDO
Survival Equipment	22-047	No	No	-
Electrical Systems	11-470	No	No	-
Battery Shop	32-129	Yes	Yes	Neutralized to San. Sewer
21st Aircraft Generation SQ (AGS)				
21st Aircraft Maint. Unit (AMU)	11-670	Yes	Yes	DPDO
43rd Aircraft Maint. Unit (AMU)	11-355	Yes	Yes	DPDO
21st Supply SQ (SUP)				
Cryogenics	32-067	No	No	-
Fuels Lab	32-069	Yes	Yes	Recycled Contaminated to DPDO

Name	Present Location (Bldg. No.)	Handles Hazardous Materials	Generates Hazardous Wastes	Typical T.S.D. Methods
21st Civil Engineering SQ (CES)				
Entomology Shop	22-021	Yes	Yes	Base landfill /DPDO
Roofing	22-045	No	No	-
Fire Equipment Maint.	32-139	No	No	-
Interior/Exterior Electrics	22-044	Yes	Yes	DPDO storage
Masonry	22-021	No	No	-
Paint Shop	22-045	Yes	Yes	DPDO
Carpentry Shop	22-045	No	No	-
Power Plant	22-004	Yes	Yes	San. Sewer
Welding	22-045	No	No	-
Diesel Maintenance	22-023	Yes	Yes	DPDO
Machine Shop	22-021	No	No	-
Pavement and Grounds	9-180 11-330 32-181 32-375	Yes	No	-
Refrigeration Shop	22-021	No	No	-
Heating Shop	22-044	No	No	-
Barrier Maintenance	22-039	Yes	Yes	DPDO
Ground Power	32-207	Yes	Yes	DPDO
Plumbing Shop	22-021	No	No	-

Name	Present Location (Bldg. No.)	Handles Hazardous Materials	Generates Hazardous Wastes	Typical T.S.D. Methods
21st Transportation SQ (Trans)				
Refueling Maintenance	31-338	Yes	Yes	DPDO
Vehicle Maintenance	21-900	Yes	Yes	DPDO
Heavy Equipment Shop	32-141	Yes	Yes	DPDO
Crash Fire Equipment Shop	10-875	Yes	Yes	DPDO
Packaging and Crating	21-884	No	No	DPDO
21st Combat Support Group (CSG)				
Auto Hobby Shop	21-200	Yes	Yes	DPDO
Aero Club	32-209	Yes	Yes	Contractor
1931st Communications Group (COMM)				
Meteorological Equipment Maint.	31-270	Yes	Yes	DPDO
6981st Electronic Security SQ. (ESS)				
Maintenance Shops	41-760	Yes	No	-
616th Consolidated Aircraft Maintenance SQ (CAMS)				
Aircraft Ground Equipment	42-425	Yes	Yes	DPDO
H43E Section	43-550	Yes	Yes	DPDO
Aerospace Systems	42-425	Yes	Yes	DPDO
Propulsion Shops	43-006	Yes	Yes	DPDO

Name	Present Location (Bldg. No.)	Handles Hazardous Materials	Generates Hazardous Wastes	Typical T.S.D. Methods
616th Consolidated Aircraft Maintenance SQ (CAMS) continued				
Refurbishment Section	42-300	Yes	Yes	DPDO
Flightline Maintenance	43-575	Yes	Yes	DPDO
USAF Hospital				
Brace Shop	24-800	No	No	-
Dental Clinic	7-800 31-280 24-800	Yes	Yes	Silver Recovery to DPDO
Pathology Lab	24-800	Yes	No	-
X-Ray	24-800	Yes	Yes	Silver Recovery to DPDO
Medical Lab	24-800	Yes	No	-
Det 5, 1369th Audiovisual SQ (AVS)				
Photo Lab	11-620	Yes	No	Silver Recovery to DPDO
5099th Civil Engineering Operations SQ (CEOS)				
Diesel Maintenance	22-023	Yes	Yes	DPDO
Industrial Shops	22-023	Yes	No	-

APPENDIX E

SUPPLEMENTAL BASE ENVIRONMENTAL DATA

TABLE E.1
LIST OF PESTICIDES CURRENTLY IN STOCK
MAY 1983

Material	Quantity	Present Storage Location
Zinc Phosphide (1 oz bottles)	3	22-021
Warfarin (5 lb.)	2	22-021
Pivalyl (1 lb)	3	22-021
Universal	3	22-021
Eaton Bait Blocks (10 lb)	2	22-021
Pyrethrum (12 oz)	72	22-021
Synergized Pyrethrum (1 gal)	20	22-021
Boric Acid (1 lb)	20	22-021
Chlorinated Lime (10 oz)	16	22-021
Diazinon 4E (1 gal)	5	22-021
Sevin Carbaryl (10 lb)	2	22-021
Jiggers	15	22-021
Bait Pans	10	22-021
Ficam W (11 lb)	3	22-021
Ficam W(4oz)	30	22-021
Ficam D (5 lb)	1	22-021
Mouse traps	18	22-021
Rat traps	24	22-021
Metasystox R (5 gal)	2	22-021
Bait Block Diphacin (10 lb)	2	22-021
Malathion (5 gal)	10	22-021
Dursban M (5 gal)	4	22-021
Insect repellent	96	22-021
Bagon Roach Bait (5 lb)	6	22-021
Diazinon 2D (5 lb)	2	22-021
Krovar 1 (50 lb)	36	22-021
Baygon (1.5 Emul) (1 gal)	12	22-021
2,4-D (5 gal)	24	22-021

Source: Elmendorf AFB records

TABLE E.2

WATER-QUALITY DATA AT ELMENDORF AIR FORCE BASE SANITARY LANDFILL AND NEARBY AREA, JUNE 22-23, 1973

(Analyses by U.S. Geological Survey, Salt Lake City, Utah)

						Milligrams per liter															Micrograms per liter										
Sample No.	Location Description	Depth to Water Below Land Surface ft. (m)		Water temp (°C)	Specific Conductance umhos at 25°C	pH	Ca Dis.	Mg Dis.	Na Dis.	K Dis.	HCO3	Cl Dis.	SO_4 Dis.	Nitrate (as N) Dis.	F Dis.	C Dis.	SiO_2	Phos. (as P) Dis.	Phos. (as P) T	Organ. (as N) Dis.	NH_4-N (as N) Dis.	Al Dis.	Cr Dis.	Cd Dis.	Cu Dis.	As Dis.	Se Dis.	Zn Dis.	Fe Dis.	Fe T	Mn Dis.	Mn T
ESL-1*	Well in landfill	37.6	(11.5)	5.0	149	7.6	20	3.2	3.0	.3	72	1.3	18	.29	.0	.0	7.8	.00	.01	.08	.00	0	0	0	24	1	14	10	0	1400	0	30
ESL-2*	Well in landfill	4.6	(1.4)	4.0	129	7.1	17	2.6	3.0	.4	49	1.0	19	.32	.0	.0	7.8	.00	.00	.09	.00	0	0	0	30	3	0	10	50	270	0	20
ESL-3*	Well 200 ft (61 m) south of landfill	13.0	(4.0)	3.5	132	7.1	18	2.9	2.4	.4	52	1.0	18	.32	.0	.5	7.6	.00	.00	.04	.00	0	0	0	25	1	1	10	50	200	0	0
ESL-4*	Well 320 ft (98 m) west of landfill	34.5	(10.5)	3.5	156	7.6	21	3.4	2.8	.4	59	1.4	23	.29	.1	.0	7.6	.00	.02	.08	.00	0	0	0	18	1	0	0	40	610	10	40
5	Well nr Ship C at Boniface Parkway	5.2	(1.6)**	3.5	137	7.0	19	2.9	2.7	.4	58	0.9	18	.25	.1	.0	7.6	.00	.00	.10	.10	0	0	0	27	0	0	220	110	850	10	20
6	Surface water Ship C Downstream from landfill	--	--	6.0	119	7.3	18	2.7	2.1	.4	54	.5	13	.11	.1	1.5	6.1	.00	.01	.10	.01	10	0	0	17	0	0	0	119	210	0	10
7	Gallery well nr Ship C downstream from landfill	9.0	(2.7)	5.0	189	7.0	27	4.9	3.0	.5	88	1.5	18	.25	.3	0.0	9.9	.01	.20	.00	.00	10	0	0	21	5	1	10	0	40	0	0
8	Surface water Ship C upstream from landfill	--	--	8.0	121	8.0	17	2.6	2.1	.4	55	0.8	13	.15	.0	2.0	6.4	.01	.02	.13	.02	20	0	0	17	1	0	10	9	190	0	0
9	Well nr U.S. Air Force Hospital	26.9	(8.2)**	8.0	246	7.8	39	6.6	3.2	.7	134	1.3	15	.30	.1	0.0	12	.01	.01	.08	.00	10	0	0	21	1	1	10	9	930	0	0

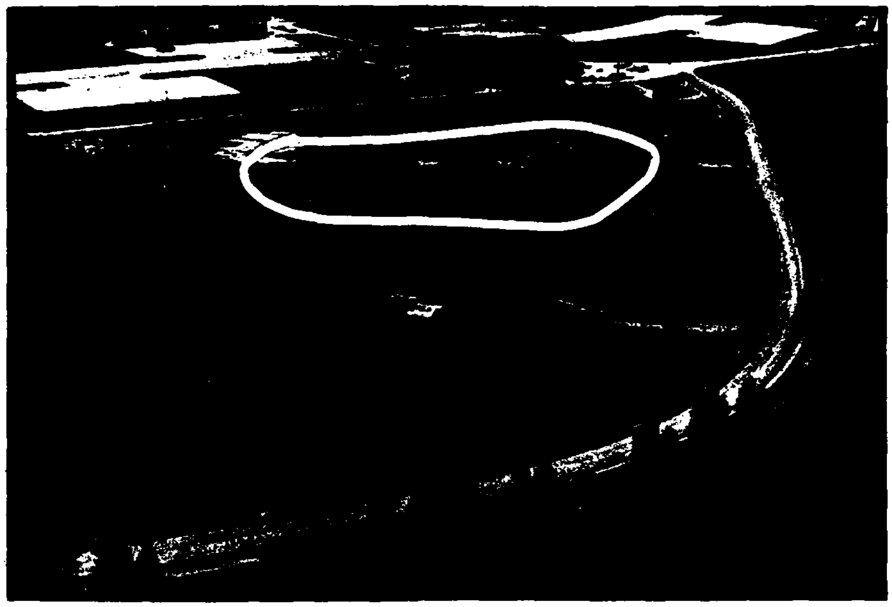
* Elmendorf Sanitary Landfill well.

** Water level measured April 23, 1973.
Dis - Dissolved
T - Total

Source: Zenore and Anderson, 1974.

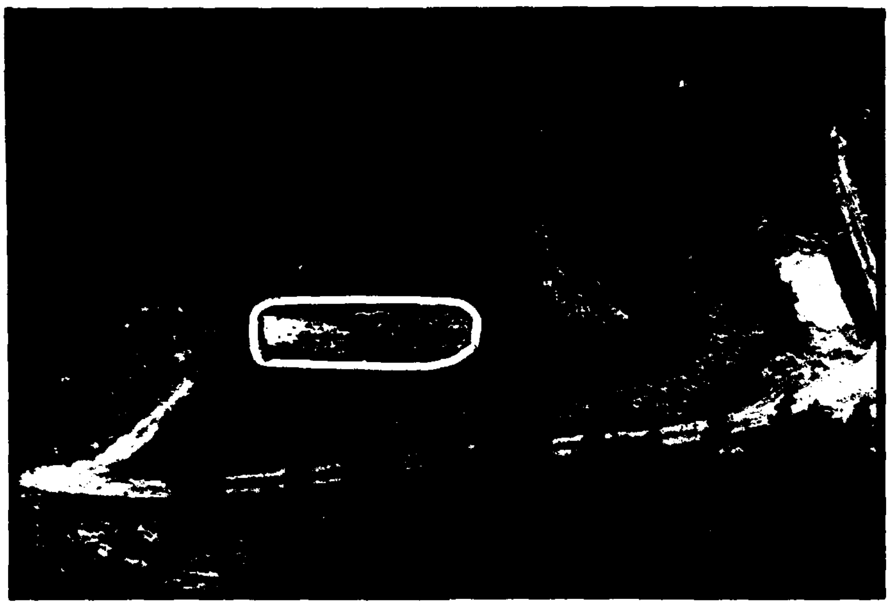
APPENDIX F

SITE PHOTOGRAPHS



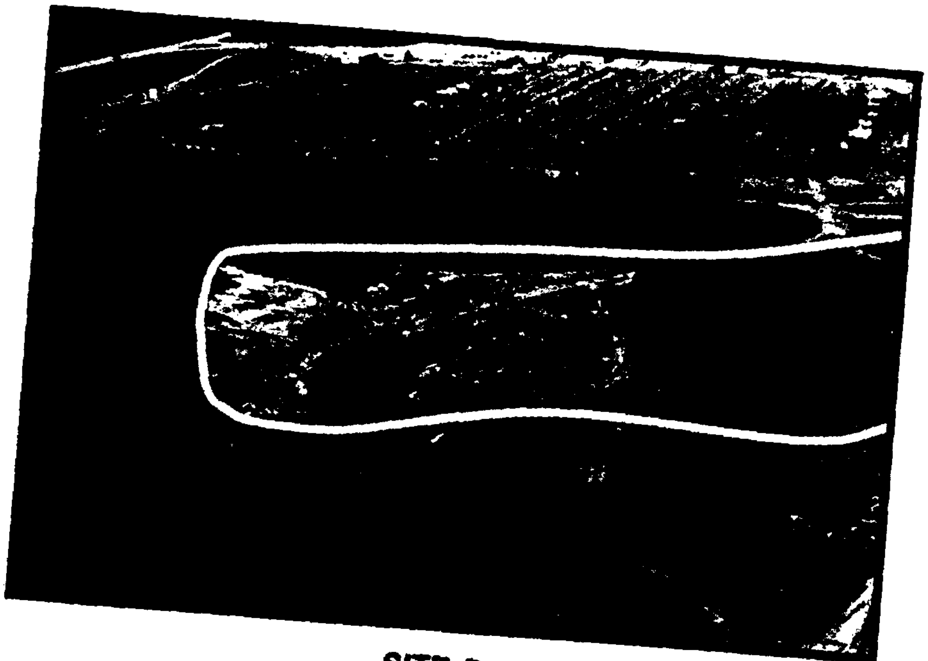
SITE FT-1

Fire Training Area



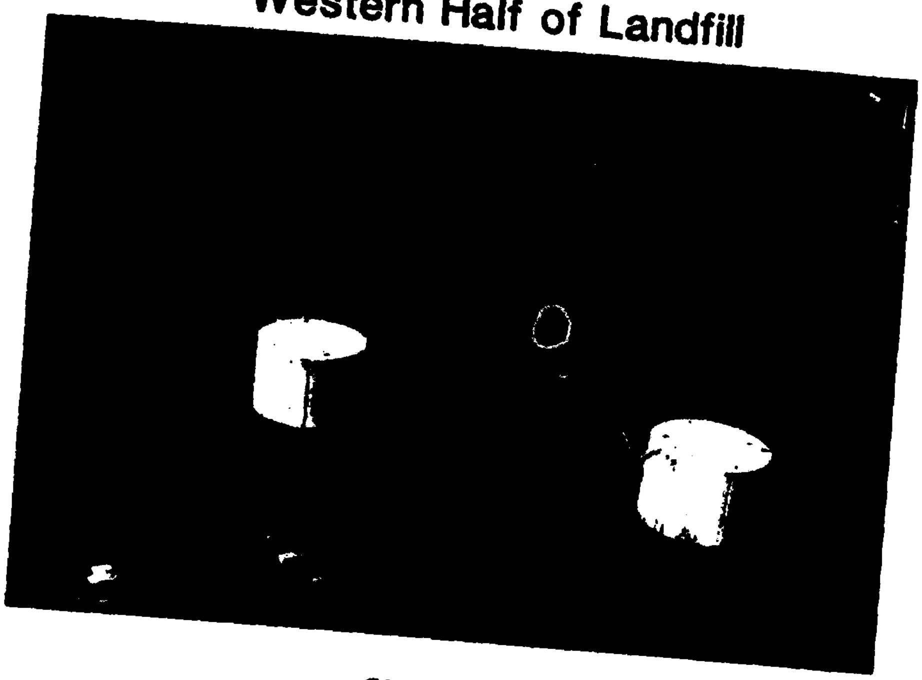
SITE D-16

POL Sludge Disposal Site No. 2



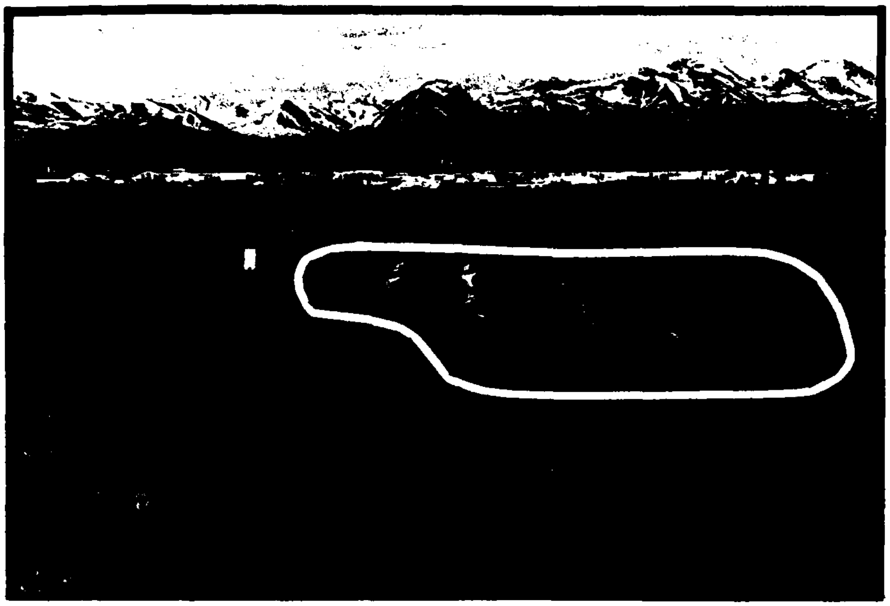
SITE D-5

Landfill
Western Half of Landfill



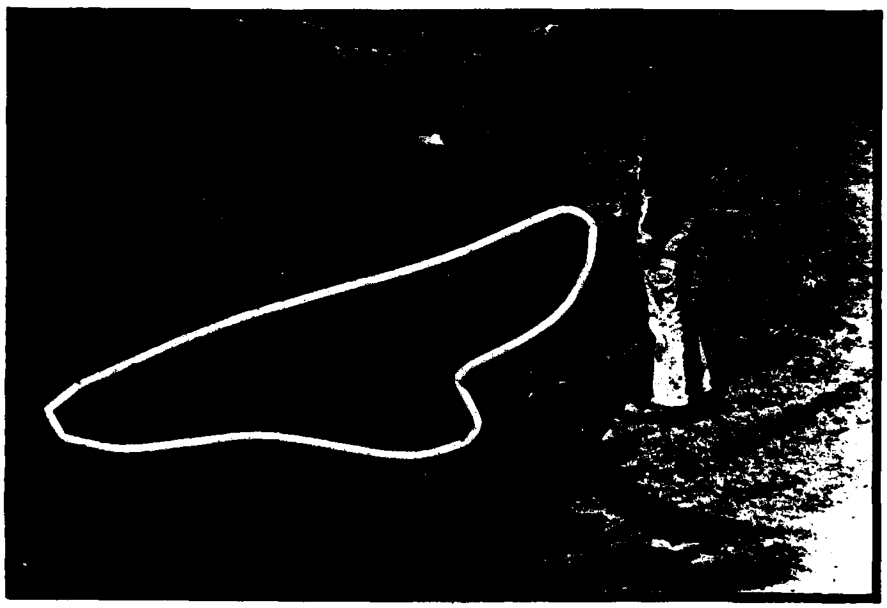
SITE SP-11

JP-4 Fuel Line Leak



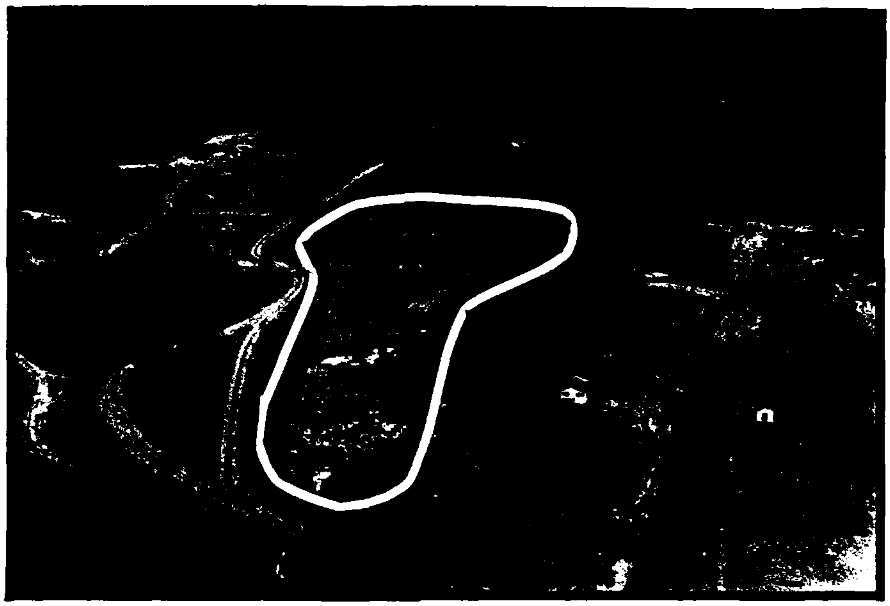
SITE SP-5

Fuel Seepage South of POL Tank Farm



SITE SP-5

Fuel Seepage South of POL Tank Farm



SITE D-7

Landfill (open pit)

SITE D-7

Landfill (closed pit)
Looking North East

APPENDIX G

HAZARD ASSESSMENT RATING METHODOLOGY

APPENDIX G

USAF INSTALLATION RESTORATION PROGRAM

HAZARD ASSESSMENT RATING METHODOLOGY

BACKGROUND

The Department of Defense (DOD) has established a comprehensive program to identify, evaluate, and control problems associated with past disposal practices at DOD facilities. One of the actions required under this program is to:

> "develop and maintain a priority listing of contaminated installations and facilities for remedial action based on potential hazard to public health, welfare, and environmental impacts." (Reference: DEQPPM 81-5, 11 December 1981).

Accordingly, the United States Air Force (USAF) has sought to establish a system to set priorities for taking further actions at sites based upon information gathered during the Records Search phase of its Installation Restoration Program (IRP).

The first site rating model was developed in June 1981 at a meeting with representatives from USAF Occupational Environmental Health Laboratory (OEHL), Air Force Engineering Services Center (AFESC), Engineering-Science (ES) and CH_2M Hill. The basis for this model was a system developed for EPA by JRB Associates of McLean, Virginia. The JRB model was modified to meet Air Force needs.

After using this model for 6 months at over 20 Air Force installations, certain inadequacies became apparent. Therefore, on January 26 and 27, 1982, representatives of USAF OEHL, AFESC, various major commands, Engineering Science, and CH_2M Hill met to address the inadequacies. The result of the meeting was a new site rating model designed to present a better picture of the hazards posed by sites at Air Force installations. The new rating model described in this presentation is referred to as the Hazard Assessment Rating Methodology.

PURPOSE

The purpose of the site rating model is to provide a relative ranking of sites of suspected contamination from hazardous substances. This model will assist the Air Force in setting priorities for follow-on site investigations and confirmation work under Phase II of IRP.

This rating system is used only after it has been determined that (1) potential for contamination exists (hazardous wastes present in sufficient quantity), and (2) potential for migration exists. A site can be deleted from consideration for rating on either basis.

DESCRIPTION OF MODEL

Like the other hazardous waste site ranking models, the U.S. Air Force's site rating model uses a scoring system to rank sites for priority attention. However, in developing this model, the designers incorporated some special features to meet specific DOD program needs.

The model uses data readily obtained during the Record Search portion (Phase I) of the IRP. Scoring judgments and computations are easily made. In assessing the hazards at a given site, the model develops a score based on the most likely routes of contamination and the worst hazards at the site. Sites are given low scores only if there are clearly no hazards at the site. This approach meshes well with the policy for evaluating and setting restrictions on excess DOD properties.

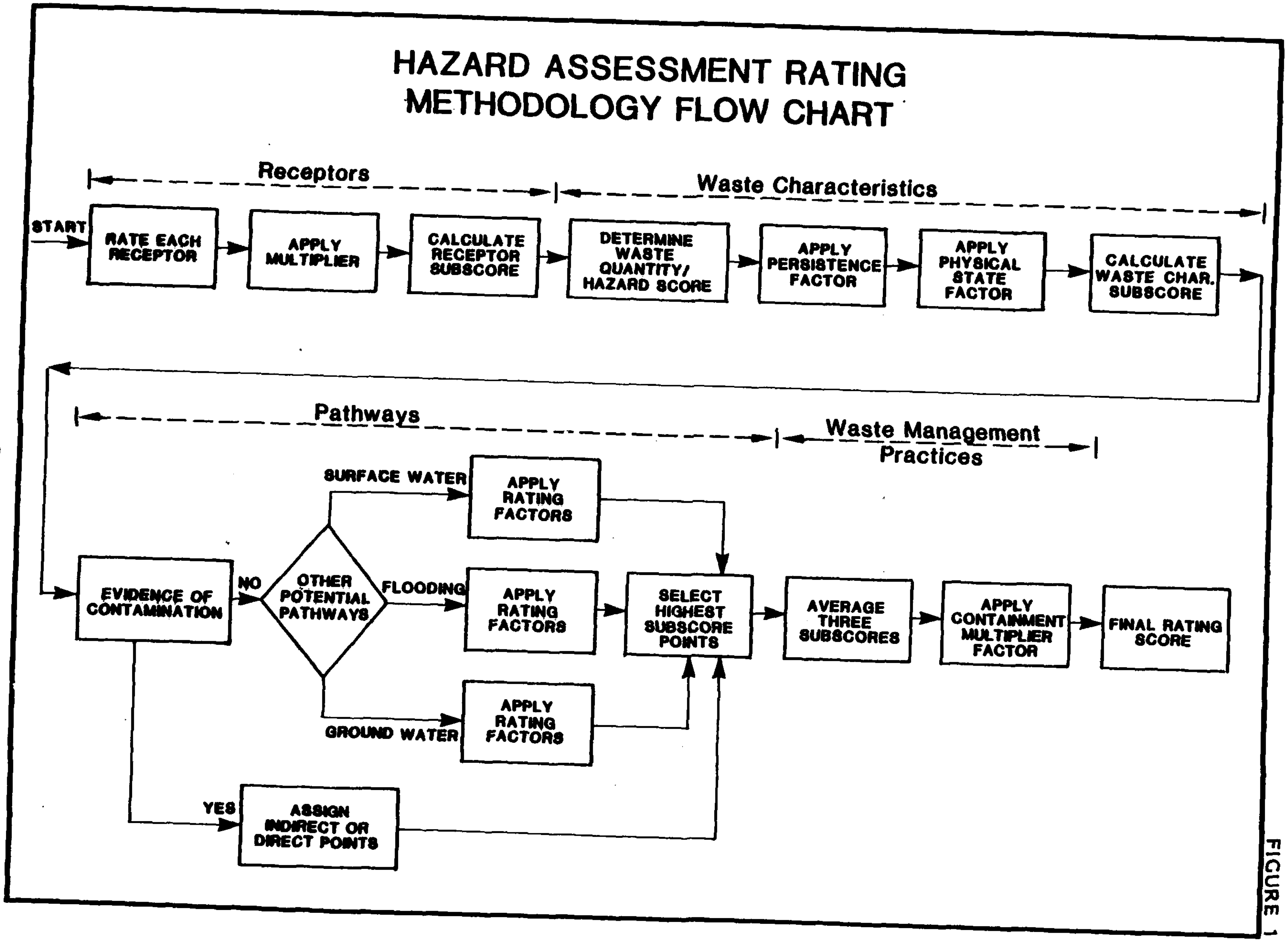
As with the previous model, this model considers four aspects of the hazard posed by a specific site: the possible receptors of the contamination, the waste and its characteristics, potential pathways for waste contaminant migration, and any efforts to contain the contaminants. Each of these categories contains a number of rating factors that are used in the overall hazard rating.

The receptors category rating is calculated by scoring each factor, multiplying by a factor weighting constant and adding the weighted scores to obtain a total category score.

The pathways category rating is based on evidence of contaminant migration or an evaluation of the highest potential (worst case) for contaminant migration along one of three pathways. If evidence of contaminant migration exists, the category is given a subscore of 80 to 100 points. For indirect evidence, 80 points are assigned and for direct evidence 100 points are assigned. If no evidence is found, the highest score among three possible routes is used. These routes are surface water migration, flooding, and ground-water migration. Evaluation of each route involves factors associated with the particular migration route. The three pathways are evaluated and the highest score among all four of the potential scores is used.

The waste characteristics category is scored in three steps. First, a point rating is assigned based on an assessment of the waste quantity and the hazard (worst case) associated with the site. The level of confidence in the information is also factored into the assessment. Next, the score is multiplied by a waste persistence factor, which acts to reduce the score if the waste is not very persistent. Finally, the score is further modified by the physical state of the waste. Liquid wastes receive the maximum score, while scores for sludges and solids are reduced.

The scores for each of the three categories are then added together and normalized to a maximum possible score of 100. Then the waste management practice category is scored. Sites at which there is no containment are not reduced in score. Scores for sites with limited containment can be reduced by 5 percent. If a site is contained and well managed, its score can be reduced by 90 percent. The final site score is calculated by applying the waste management practices category factor to the sum of the scores for the other three categories.



HAZARD ASSESSMENT RATING
METHODOLOGY FLOW CHART
Receptors
Waste Characteristics
START
RATE EACH RECEPTOR
APPLY MULTIPLIER
CALCULATE RECEPTOR SUBSCORE
DETERMINE WASTE QUANTITY/ HAZARD SCORE
APPLY PERSISTENCE FACTOR
APPLY PHYSICAL STATE FACTOR
CALCULATE WASTE CHAR. SUBSCORE
Pathways
Waste Management Practices
EVIDENCE OF CONTAMINATION
NO
OTHER POTENTIAL PATHWAYS
SURFACE WATER
FLOODING
GROUND WATER
APPLY RATING FACTORS
APPLY RATING FACTORS
APPLY RATING FACTORS
YES
ASSIGN INDIRECT OR DIRECT POINTS
SELECT HIGHEST SUBSCORE POINTS
AVERAGE THREE SUBSCORES
APPLY CONTAINMENT MULTIPLIER FACTOR
FINAL RATING SCORE

FIGURE 1

FIGURE 2

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE ______________________

LOCATION ______________________

DATE OF OPERATION OR OCCURRENCE ______________________

OWNER/OPERATOR ______________________

COMMENTS/DESCRIPTION ______________________

SITE RATED BY ______________________

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site		4		
B. Distance to nearest well		10		
C. Land use/zoning within 1 mile radius		3		
D. Distance to reservation boundary		6		
E. Critical environments within 1 mile radius of site		10		
F. Water quality of nearest surface water body		6		
G. Ground water use of uppermost aquifer		9		
H. Population served by surface water supply within 3 miles downstream of site		6		
I. Population served by ground-water supply within 3 miles of site		6		

Subtotals ______ ______

Receptors subscore (100 X factor score subtotal/maximum score subtotal) ______

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) ______
2. Confidence level (C = confirmed, S = suspected) ______
3. Hazard rating (H = high, M = medium, L = low) ______

Factor Subscore A (from 20 to 100 based on factor score matrix) ______

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

______ X ______ = ______

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

______ X ______ = ______

FIGURE 2 (Continued)

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore ______

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water		8		
Net precipitation		6		
Surface erosion		8		
Surface permeability		6		
Rainfall intensity		8		

Subtotals ______ ______

Subscore (100 X factor score subtotal/maximum score subtotal) ______

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
2. Flooding		1		

Subscore (100 x factor score/3) ______

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water		8		
Net precipitation		6		
Soil permeability		8		
Subsurface flows		8		
Direct access to ground water		8		

Subtotals ______ ______

Subscore (100 x factor score subtotal/maximum score subtotal) ______

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore ______

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors ______
Waste Characteristics ______
Pathways ______

Total ______ divided by 3 = ______
Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

______ X ______ = ☐

TABLE 1

HAZARD ASSESSMENT RATING METHODOLOGY GUIDELINES

I. RECEPTORS CATEGORY

Rating Factors	Rating Scale Levels 0	1	2	3	Multiplier
A. Population within 1,000 feet (includes on-base facilities)	0	1 - 25	26 - 100	Greater than 100	4
B. Distance to nearest water well	Greater than 3 miles	1 to 3 miles	3,001 feet to 1 mile	0 to 3,000 feet	10
C. Land Use/Zoning (within 1 mile radius)	Completely remote (zoning not applicable)	Agricultural	Commercial or industrial	Residential	3
D. Distance to installation boundary	Greater than 2 miles	1 to 2 miles	1,001 feet to 1 mile	0 to 1,000 feet	6
E. Critical environments (within 1 mile radius)	Not a critical environment	Natural areas	Pristine natural areas; minor wetlands; preserved areas; presence of economically important natural resources susceptible to contamination.	Major habitat of an endangered or threatened species; presence of recharge area; major wetlands.	10
F. Water quality/use designation of nearest surface water body	Agricultural or industrial use.	Recreation, propagation and management of fish and wildlife.	Shellfish propagation and harvesting.	Potable water supplies	6
G. Ground-Water use of uppermost aquifer	Not used, other sources readily available.	Commercial, industrial, or irrigation, very limited other water sources.	Drinking water, municipal water available.	Drinking water, no municipal water available; commercial, industrial, or irrigation, no other water source available.	9
H. Population served by surface water supplies within 3 miles downstream of site	0	1 - 50	51 - 1,000	Greater than 1,000	6
I. Population served by aquifer supplies within 3 miles of site	0	1 - 50	51 - 1,000	Greater than 1, 000	6

TABLE 1 (Continued)

HAZARD ASSESSMENT RATING METHODOLOGY GUIDELINES

II. WASTE CHARACTERISTICS

A-1 Hazardous Waste Quantity

S = Small quantity (<5 tons or 20 drums of liquid)
M = Moderate quantity (5 to 20 tons or 21 to 85 drums of liquid)
L = Large quantity (>20 tons or 85 drums of liquid)

A-2 Confidence Level of Information

C = Confirmed confidence level (minimum criteria below)

- o Verbal reports from interviewer (at least 2) or written information from the records.
- o Knowledge of types and quantities of wastes generated by shops and other areas on base.
- o Based on the above, a determination of the types and quantities of waste disposed of at the site.

S = Suspected confidence level

- o No verbal reports or conflicting verbal reports and no written information from the records.
- o Logic based on a knowledge of the types and quantities of hazardous wastes generated at the base, and a history of past waste disposal practices indicate that these wastes were disposed of at a site.

A-3 Hazard Rating

Hazard Category	Rating Scale Levels 0	1	2	3
Toxicity	Sax's Level 0	Sax's Level 1	Sax's Level 2	Sax's Level 3
Ignitability	Flash point greater than 200°F	Flash point at 140°F to 200°F	Flash point at 80°F to 140°F	Flash point less than 80°F
Radioactivity	At or below background levels	1 to 3 times background levels	3 to 5 times background levels	Over 5 times background levels

Use the highest individual rating based on toxicity, ignitability and radioactivity and determine the hazard rating.

Hazard Rating	Points
High (H)	3
Medium (M)	2
Low (L)	1

TABLE 1 (Continued)

HAZARD ASSESSMENT RATING METHODOLOGY GUIDELINES

II. WASTE CHARACTERISTICS (Continued)

Waste Characteristics Matrix

Point Rating	Hazardous Waste Quantity	Confidence Level of Information	Hazard Rating
100	L	C	H
80	L	C	M
	M	C	H
70	L	S	H
60	S	C	H
	M	C	M
50	L	S	M
	L	C	L
	M	S	H
	S	C	M
40	S	S	H
	M	S	M
	M	C	L
	L	S	L
30	S	C	L
	M	S	L
	S	S	M
20	S	S	L

Notes:
For a site with more than one hazardous waste, the waste quantities may be added using the following rules:
Confidence Level
- o Confirmed confidence levels (C) can be added
- o Suspected confidence levels (S) can be added
- o Confirmed confidence levels cannot be added with suspected confidence levels

Waste Hazard Rating
- o Wastes with the same hazard rating can be added
- o Wastes with different hazard ratings can only be added in a downgrade mode, e.g., MCM + SCH = LCM if the total quantity is greater than 20 tons.

Example: Several wastes may be present at a site, each having an MCM designation (60 points). By adding the quantities of each waste, the designation may change to LCM (80 points). *In this case,* the correct point rating for the waste is 80.

B. Persistence Multiplier for Point Rating

Persistence Criteria	Multiply Point Rating From Part A by the Following
Metals, polycyclic compounds, and halogenated hydrocarbons	1.0
Substituted and other ring compounds	0.9
Straight chain hydrocarbons	0.8
Easily biodegradable compounds	0.4

C. Physical State Multiplier

Physical State	Multiply Point Total From Parts A and B by the Following
Liquid	1.0
Sludge	0.75
Solid	0.50

TABLE 1 (Continued)

HAZARD ASSESSMENT RATING METHODOLOGY GUIDELINES

III. PATHWAYS CATEGORY

A. Evidence of Contamination

Direct evidence is obtained from laboratory analyses of hazardous contaminants present above natural background levels in surface water, ground water, or air. Evidence should confirm that the source of contamination is the site being evaluated.

Indirect evidence might be from visual observation (i.e., leachate), vegetation stress, sludge deposits, presence of taste and odors in drinking water, or reported discharges that cannot be directly confirmed as resulting from the site, but the site is greatly suspected of being a source of contamination.

B-1 POTENTIAL FOR SURFACE WATER CONTAMINATION

Rating Factor	Rating Scale Levels 0	1	2	3	Multiplier
Distance to nearest surface water (includes drainage ditches and storm sewers)	Greater than 1 mile	2,001 feet to 1 mile	501 feet to 2,000 feet	0 to 500 feet	8
Net precipitation	Less than -10 in.	-10 to + 5 in.	+5 to +20 in.	Greater than +20 in.	6
Surface erosion	None	Slight	Moderate	Severe	8
Surface permeability	0% to 15% clay ($>10^{-2}$ cm/sec)	15% to 30% clay (10^{-2} to 10^{-4} cm/sec)	30% to 50% clay (10^{-4} to 10^{-6} cm/sec)	Greater than 50% clay ($<10^{-6}$ cm/sec)	6
Rainfall intensity based on 1 year 24-hr rainfall	<1.0 inch	1.0-2.0 inches	2.1-3.0 inches	>3.0 inches	8

B-2 POTENTIAL FOR FLOODING

Rating Factor	0	1	2	3	Multiplier
Floodplain	Beyond 100-year floodplain	In 25-year flood-plain	In 10-year flood-plain	Floods annually	1

B-3 POTENTIAL FOR GROUND-WATER CONTAMINATION

Rating Factor	0	1	2	3	Multiplier
Depth to ground water	Greater than 500 ft	50 to 500 feet	11 to 50 feet	0 to 10 feet	8
Net precipitation	Less than -10 in.	-10 to +5 in.	+5 to +20 in.	Greater than +20 in.	6
Soil permeability	Greater than 50% clay ($>10^{-6}$ cm/sec)	30% to 50% clay (10^{-4} to 10^{-6} cm/sec)	15% to 30% clay (10^{-2} to 10^{-4} cm/sec)	0% to 15% clay ($<10^{-2}$ cm/sec)	8
Subsurface flows	Bottom of site greater than 5 feet above high ground-water level	Bottom of site occasionally submerged	Bottom of site frequently submerged	Bottom of site located below mean ground-water level	8
Direct access to ground water (through faults, fractures, faulty well casings, subsidence fissures, etc.)	No evidence of risk	Low risk	Moderate risk	High risk	8

TABLE 1 (Continued)

HAZARD ASSESSMENT RATING METHODOLOGY GUIDELINES

IV. **WASTE MANAGEMENT PRACTICES CATEGORY**

A. This category adjusts the total risk as determined from the receptors, pathways, and waste characteristics categories for waste management practices and engineering controls designed to reduce this risk. The total risk is determined by first averaging the receptors, pathways, and waste characteristics subscores.

B. **WASTE MANAGEMENT PRACTICES FACTOR**

The following multipliers are then applied to the total risk points (from A):

Waste Management Practice	Multiplier
No containment	1.0
Limited containment	0.95
Fully contained and in full compliance	0.10

Guidelines for fully contained:

Landfills:

- o Clay cap or other impermeable cover
- o Leachate collection system
- o Liners in good condition
- o Adequate monitoring wells

Spills:

- o Quick spill cleanup action taken
- o Contaminated soil removed
- o Soil and/or water samples confirm total cleanup of the spill

Surface Impoundments:

- o Liners in good condition
- o Sound dikes and adequate freeboard
- o Adequate monitoring wells

Fire Proection Training Areas:

- o Concrete surface and berms
- o Oil/water separator for pretreatment of runoff
- o Effluent from oil/water separator to treatment plant

General Note: If data are not available or known to be complete the factor ratings under items I-A through I, III-B-1 or III-B-3, then leave blank for calculation of factor score and maximum possible score.

APPENDIX H

SITE ASSESSMENT RATING FORMS

HAZARD ASSESSMENT RATING METHODOLOGY FORMS

TABLE OF CONTENTS

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE SP-5, JP-4 Tank Spill, Avgas spill

LOCATION North of Loop Road, west of Brown Road

DATE OF OPERATION OR OCCURRENCE August 30, 1974, mid 1960's

OWNER/OPERATOR Elmendorf AFB

COMMENTS/DESCRIPTION Bulk storage tanks Nos. 601-604, 60,000 gal - Avgas spill; 33,000 gal JP-4 spill/SPCC Plan

SITE RATED BY W. G. Christopher

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	1	4	4	12
B. Distance to nearest well	1	10	10	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundary	2	6	12	18
E. Critical environments within 1 mile radius of site	2	10	20	30
F. Water quality of nearest surface water body	2	6	12	18
G. Ground water use of uppermost aquifer	1	9	9	27
H. Population served by surface water supply within 3 miles downstream of site	3	6	18	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	112	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 62

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) L
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 80

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

80 x 0.8 = 64

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

64 x 1.0 = 64

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 80

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	1	8	8	24
Net precipitation	2	6	12	18
Surface erosion	1	8	8	24
Surface permeability	0	6	0	18
Rainfall intensity	3	8	24	24
Subtotals			52	108

Subscore (100 X factor score subtotal/maximum score subtotal) 48

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding	0	1	0	1

Subscore (100 x factor score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	2	6	12	18
Soil permeability	3	8	24	24
Subsurface flows	0	8	0	24
Direct access to ground water	2	8	16	24
Subtotals			68	114

Subscore (100 x factor score subtotal/maximum score subtotal) 60

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 80

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	62
Waste Characteristics	64
Pathways	80
Total 206 divided by 3 =	69 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

69 x 0.95 = 66

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE D-5 Landfill

LOCATION West of Ammo storage area "B", east of Marketing & Redistribution, north of Ship Creek

DATE OF OPERATION OR OCCURRENCE 1951-1973

OWNER/OPERATOR Elmendorf AFB

COMMENTS/DESCRIPTION Trench excavation 14'-16' depth, metals, general refuse, maybe drums, may have been used by DPDO

SITE RATED BY W. G. Christopher

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	1	4	4	12
B. Distance to nearest well	1	10	10	30
C. Land use/zoning within 1 mile radius	2	3	6	9
D. Distance to reservation boundary	2	6	12	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	1	9	9	27
H. Population served by surface water supply within 3 miles downstream of site	3	6	18	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
Subtotals			83	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 46

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) L
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 100

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

100 x 0.8 = 80

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

80 x 1.0 = 80

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore ______

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	2	8	16	24
Net precipitation	2	6	12	18
Surface erosion	1	8	8	24
Surface permeability	0	6	0	24
Rainfall intensity	3	8	24	24
		Subtotals	60	108

Subscore (100 X factor score subtotal/maximum score subtotal) 56

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding	0	1	0	1

Subscore (100 x factor score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	2	6	12	18
Soil permeability	3	8	24	24
Subsurface flows	1	8	8	24
Direct access to ground water	2	8	16	24
		Subtotals	86	114

Subscore (100 x factor score subtotal/maximum score subtotal) 75

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 75

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	46
Waste Characteristics	80
Pathways	75
Total 201 divided by 3 =	67 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

67 x 0.95 = $\boxed{64}$

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE SP-7 Pumphouse No. 3 JP-4 Fuel Spill
LOCATION South of Burns Road, west of Hangar 8
DATE OF OPERATION OR OCCURRENCE Sept. 27, 1980
OWNER/OPERATOR Elmendorf AFB
COMMENTS/DESCRIPTION 36,000 gallon spill (SPCC Plan)
SITE RATED BY W. G. Christopher

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	1	4	4	12
B. Distance to nearest well	1	10	10	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundary	1	6	6	18
E. Critical environments within 1 mile radius of site	1	10	10	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	1	9	9	27
H. Population served by surface water supply within 3 miles downstream of site	3	6	18	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
Subtotals			90	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 50

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) L
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 100

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

100 x 0.8 = 80

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

80 x 1.0 = 80

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore ______

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	1	8	8	24
Net precipitation	2	6	12	18
Surface erosion	1	8	8	24
Surface permeability	0	6	0	18
Rainfall intensity	3	8	24	24
		Subtotals	52	108

Subscore (100 X factor score subtotal/maximum score subtotal) 48

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding	0	1	0	1

Subscore (100 x factor score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	2	6	12	18
Soil permeability	3	8	24	24
Subsurface flows	1	8	8	24
Direct access to ground water	2	8	16	24
		Subtotals	76	114

Subscore (100 x factor score subtotal/maximum score subtotal) 67

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 67

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	50
Waste Characteristics	80
Pathways	67

Total 197 divided by 3 = 66 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

66 x 0.95 = 63

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE SP-10 Pumphouse No. 3 JP-4 Fuel Spill

LOCATION

DATE OF OPERATION OR OCCURRENCE 1964-1965

OWNER/OPERATOR Elmendorf AFB

COMMENTS/DESCRIPTION 50,000 gallons

SITE RATED BY W. G. Christopher

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	1	4	4	12
B. Distance to nearest well	1	10	10	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundary	1	6	6	18
E. Critical environments within 1 mile radius of site	1	10	10	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	1	9	9	27
H. Population served by surface water supply within 3 miles downstream of site	3	6	18	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	90	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 50

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) L
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 100

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

100 x 0.8 = 80

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

80 x 1.0 = 80

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore ______

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	1	8	8	24
Net precipitation	2	6	12	18
Surface erosion	1	8	8	24
Surface permeability	0	6	0	18
Rainfall intensity	3	8	24	24
Subtotals			52	108

Subscore (100 X factor score subtotal/maximum score subtotal) 48

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
2. Flooding	0	1	0	1

Subscore (100 x factor score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	2	6	12	18
Soil permeability	3	8	24	24
Subsurface flows	1	8	8	24
Direct access to ground water	2	8	16	24
Subtotals			76	114

Subscore (100 x factor score subtotal/maximum score subtotal) 67

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 67

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	50
Waste Characteristics	80
Pathways	67
Total 197 divided by 3 =	66
	Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

66 x 0.95 = 63

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE SP-11 JP-4 Line Leak (23714)

LOCATION Within Alaska Railroad boundaries, north of former Cooling Pond W.5,126

DATE OF OPERATION OR OCCURRENCE 1978

OWNER/OPERATOR Elmendorf AFB

COMMENTS/DESCRIPTION

SITE RATED BY W. G. Christopher

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	1	10	10	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	0	6	0	18
G. Ground water use of uppermost aquifer	1	9	9	27
H. Population served by surface water supply within 3 miles downstream of site	3	6	18	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	94	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 52

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) M
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 80

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

80 x 0.8 = 64

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

64 x 1.0 = 64

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 80

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	3	8	24	24
Net precipitation	2	6	12	18
Surface erosion	1	8	8	24
Surface permeability	0	6	0	18
Rainfall intensity	3	8	24	24
		Subtotals	68	108

Subscore (100 X factor score subtotal/maximum score subtotal) 63

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
2. Flooding	0	1	0	1

Subscore (100 x factor score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	2	6	12	18
Soil permeability	3	8	24	24
Subsurface flows	1	8	8	24
Direct access to ground water	2	8	16	24
		Subtotals	76	114

Subscore (100 x factor score subtotal/maximum score subtotal) 67

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 67

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	52
Waste Characteristics	64
Pathways	80

Total 196 divided by 3 = 65 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

65 x 0.95 = $\boxed{62}$

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE Fire Training Area No 1

LOCATION Near Building 43-585

DATE OF OPERATION OR OCCURRENCE

OWNER/OPERATOR Elmendorf AFB

COMMENTS/DESCRIPTION

SITE RATED BY W. G Christopher

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	0	4	0	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	2	3	6	9
D. Distance to reservation boundary	0	6	0	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	1	9	9	27
H. Population served by surface water supply within 3 miles downstream of site	3	6	18	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
Subtotals			87	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 48

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) L
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 100

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

100 x 0.8 = 80

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

80 x 1.0 = 80

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore ____

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	1	8	8	24
Net precipitation	2	6	12	18
Surface erosion	1	8	8	24
Surface permeability	0	6	0	18
Rainfall intensity	3	8	24	24
		Subtotals	52	108

Subscore (100 X factor score subtotal/maximum score subtotal) 48

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding	0	1	0	3

Subscore (100 x factor score/3) ____

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	2	6	12	18
Soil permeability	3	8	24	24
Subsurface flows	0	8	0	24
Direct access to ground water	2	8	16	24
		Subtotals	68	114

Subscore (100 x factor score subtotal/maximum score subtotal) 60

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 60

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	48
Waste Characteristics	80
Pathways	60
Total 188 divided by 3 =	63
	Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

63 x 0.95 = 60

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE S-6 Old PCB Transformer Storage Area

LOCATION

DATE OF OPERATION OR OCCURRENCE 1977

OWNER/OPERATOR Elmendorf AFB

COMMENTS/DESCRIPTION

SITE RATED BY i.' G. Christopher

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	1	9	9	27
H. Population served by surface water supply within 3 miles downstream of site	3	6	18	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	120	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 67

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) S
2. Confidence level (C = confirmed, S = suspected) S
3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 40

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

40 x 1.0 = 40

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

40 x 1.0 = 40

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore ______

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	2	8	16	24
Net precipitation	2	6	12	18
Surface erosion	1	8	8	24
Surface permeability	0	6	0	18
Rainfall intensity	3	8	24	24
		Subtotals	60	108

Subscore (100 X factor score subtotal/maximum score subtotal) 56

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding	0	1	0	1

Subscore (100 x factor score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	2	6	12	18
Soil permeability	3	8	24	24
Subsurface flows	1	8	8	24
Direct access to ground water	2	8	16	24
		Subtotals	76	114

Subscore (100 x factor score subtotal/maximum score subtotal) 67

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 67

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	67
Waste Characteristics	40
Pathways	67

Total 174 divided by 3 = 58 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

58 x 1.0 = 58

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE IS-1

LOCATION Building 42-400

DATE OF OPERATION OR OCCURRENCE late 1950's through present

OWNER/OPERATOR Elmendorf AFB

COMMENTS/DESCRIPTION Floor drains discharge to dry wells

SITE RATED BY W. G. Christopher

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	2	4	8	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	2	3	6	9
D. Distance to reservation boundary	1	6	6	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	1	9	9	27
H. Population served by surface water supply within 3 miles downstream of site	3	6	18	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	101	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 56

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) M
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 80

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

80 x 0.8 = 64

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

64 x 1.0 = 64

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore ____

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	-	8	-	-
Net precipitation	-	6	-	-
Surface erosion	-	8	-	-
Surface permeability	-	6	-	-
Rainfall intensity	-	8	-	-
Subtotals			-	-

Subscore (100 X factor score subtotal/maximum score subtotal) -

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding	0	1	0	1

Subscore (100 x factor score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	2	6	12	18
Soil permeability	3	8	24	24
Subsurface flows	0	8	0	24
Direct access to ground water	2	8	16	24
Subtotals			68	114

Subscore (100 x factor score subtotal/maximum score subtotal) 60

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 60

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	56
Waste Characteristics	64
Pathways	60

Total 180 divided by 3 = 60 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

60 x 0.95 = 57

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE SP-2 JP-4 Fuel Line Leak (seepage)

LOCATION Just north of Alaska Railroad, south of Wilson Dr, east of Maple St.

DATE OF OPERATION OR OCCURRENCE 1964-1965

OWNER/OPERATOR Elmendorf AFB

COMMENTS/DESCRIPTION Fuel seepage out of tank, across Post Road ditch

SITE RATED BY [illegible]

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	2	10	20	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	1	9	9	27
H. Population served by surface water supply within 3 miles downstream of site	3	6	18	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	110	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 61

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) S
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 60

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

60 x 0.8 = 48

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

48 x 1.0 = 48

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore ______

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	3	8	24	24
Net precipitation	2	6	12	18
Surface erosion	1	8	8	24
Surface permeability	0	6	0	18
Rainfall intensity	3	8	24	24
		Subtotals	68	108

Subscore (100 X factor score subtotal/maximum score subtotal) 63

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding	0	1	0	1

Subscore (100 x factor score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	2	6	18	18
Soil permeability	3	8	24	24
Subsurface flows	1	8	8	24
Direct access to ground water	2	8	16	24
		Subtotals	82	114

Subscore (100 x factor score subtotal/maximum score subtotal) 72

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 72

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	61
Waste Characteristics	48
Pathways	72

Total 181 divided by 3 = 60 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

60 x 0.95 = 57

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE SP-14 Mogas Spill

LOCATION On "P" Street south of 35th Street

DATE OF OPERATION OR OCCURRENCE 1965

OWNER/OPERATOR Elmendorf AFB

COMMENTS/DESCRIPTION 15,000 gallons

SITE RATED BY W. G. Christopher

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	1	10	10	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundary	2	6	12	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	1	9	9	27
H. Population served by surface water supply within 3 miles downstream of site	3	6	18	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	94	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 52

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) S
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 60

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

60 x 1.0 = 60

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

60 x 1.0 = 60

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore ______

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	1	8	8	24
Net precipitation	2	6	12	18
Surface erosion	1	8	8	24
Surface permeability	0	6	0	18
Rainfall intensity	3	8	24	24
		Subtotals	52	108

Subscore (100 X factor score subtotal/maximum score subtotal) 48

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding	0	1	0	1

Subscore (100 x factor score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	2	6	12	18
Soil permeability	3	8	24	24
Subsurface flows	1	8	8	24
Direct access to ground water	2	8	16	24
		Subtotals	76	114

Subscore (100 x factor score subtotal/maximum score subtotal) 67

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 67

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors 52
Waste Characteristics 60
Pathways 67

Total 179 divided by 3 = 60
Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

60 x 0.95 = $\boxed{57}$

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE D-17 Shop Waste Disposal Site

LOCATION West of Building 31-260

DATE OF OPERATION OR OCCURRENCE

OWNER/OPERATOR Elmendorf AFB

COMMENTS/DESCRIPTION

SITE RATED BY W. G. Christopher

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	0	4	0	12
B. Distance to nearest well	1	10	10	30
C. Land use/zoning within 1 mile radius	2	3	6	9
D. Distance to reservation boundary	1	6	6	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	1	9	9	27
H. Population served by surface water supply within 3 miles downstream of site	3	6	18	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	73	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 41

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) M
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 80

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

80 x 1.0 = 80

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

80 x 1.0 = 80

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore ______

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	0	8	0	24
Net precipitation	2	6	12	18
Surface erosion	1	8	8	24
Surface permeability	0	6	0	18
Rainfall intensity	3	8	24	24
Subtotals			44	108

Subscore (100 X factor score subtotal/maximum score subtotal) 41

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
2. Flooding	0	1	0	0

Subscore (100 x factor score/3) ______

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	2	6	12	18
Soil permeability	3	8	24	24
Subsurface flows	1	8	8	24
Direct access to ground water	2	8	16	24
Subtotals			76	114

Subscore (100 x factor score subtotal/maximum score subtotal) 67

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 67

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	41
Waste Characteristics	80
Pathways	67
Total 168 divided by 3 =	56 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

56 x 1.0 = $\boxed{56}$

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE SP-15 Avgas Spill

LOCATION Just north of 22nd Street, east of 23rd Street

DATE OF OPERATION OR OCCURRENCE 1961

OWNER/OPERATOR Elmendorf AFB

COMMENTS/DESCRIPTION 1,000 gallons

SITE RATED BY W. G. Christopher

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	2	4	8	12
B. Distance to nearest well	1	10	10	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundary	2	6	12	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	1	9	9	27
H. Population served by surface water supply within 3 miles downstream of site	3	6	18	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	90	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 50

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) S
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 60

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

60 x 1.0 = 60

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

60 x 1.0 = 60

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore _____

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	1	8	8	24
Net precipitation	2	6	12	18
Surface erosion	1	8	8	24
Surface permeability	0	6	0	18
Rainfall intensity	3	8	24	24
		Subtotals	52	108

Subscore (100 X factor score subtotal/maximum score subtotal) 48

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
2. Flooding	0	1	0	1

Subscore (100 x factor score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	2	6	12	18
Soil permeability	3	8	24	24
Subsurface flows	1	8	8	24
Direct access to ground water	2	8	16	24
		Subtotals	76	114

Subscore (100 x factor score subtotal/maximum score subtotal) 67

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 67

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	50
Waste Characteristics	60
Pathways	67

Total 177 divided by 3 = 59 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

59 x 0.95 = $\boxed{56}$

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE D-15 POL Sludge Disposal Site No. 2

LOCATION East of Knik Arm, north of Cherry Hill Qtrs.

DATE OF OPERATION OR OCCURRENCE 1964-1968

OWNER/OPERATOR Elmendorf AFB

COMMENTS/DESCRIPTION POL Tank Cleanouts

SITE RATED BY W. G. Christopher

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	1	4	4	12
B. Distance to nearest well	1	10	10	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	2	10	20	30
F. Water quality of nearest surface water body	2	6	12	18
G. Ground water use of uppermost aquifer	1	9	9	27
H. Population served by surface water supply within 3 miles downstream of site	3	6	18	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
Subtotals			118	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 66

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) M
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 80

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

80 x 0.8 = 64

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

64 x 0.75 = 48

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore ______

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	2	8	16	24
Net precipitation	2	6	12	18
Surface erosion	1	8	8	24
Surface permeability	0	6	0	18
Rainfall intensity	3	8	24	24
Subtotals			60	108

Subscore (100 X factor score subtotal/maximum score subtotal) 56

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding	0	1	0	1

Subscore (100 x factor score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	2	6	12	18
Soil permeability	3	8	24	24
Subsurface flows	0	8	0	24
Direct access to ground water	2	8	16	24
Subtotals			68	114

Subscore (100 x factor score subtotal/maximum score subtotal) 60

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 60

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	66
Waste Characteristics	48
Pathways	60
Total 174 divided by 3 =	58
	Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

58 x 0.95 = $\boxed{55}$

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE D-7 Landfill

LOCATION East of Davis Highway, north of Ship Creek

DATE OF OPERATION OR OCCURRENCE 1965-1983

OWNER/OPERATOR Elmendorf AFB

COMMENTS/DESCRIPTION General refuse, garbage in gravel pit area 40' depth

SITE RATED BY W G Christopher

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	1	4	4	12
B. Distance to nearest well	1	10	10	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundary	2	6	12	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	1	9	9	27
H. Population served by surface water supply within 3 miles downstream of site	3	6	18	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	86	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 48

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) L
2. Confidence level (C = confirmed, S = suspected) S
3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 70

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

70 x 0.8 = 54

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

54 x 1.0 = 54

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore ____

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	2	8	16	24
Net precipitation	2	6	12	18
Surface erosion	1	8	8	24
Surface permeability	0	6	0	18
Rainfall intensity	3	8	24	24
Subtotals			60	108

Subscore (100 X factor score subtotal/maximum score subtotal) 56

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
2. Flooding	0	1	0	1

Subscore (100 x factc- score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	2	6	12	18
Soil permeability	3	8	24	24
Subsurface flows	1	8	8	24
Direct access to ground water	2	8	16	24
Subtotals			76	114

Subscore (100 x factor score subtotal/maximum score subtotal) 67

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 67

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	48
Waste Characteristics	54
Pathways	67
Total 169 divided by 3 =	56 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

56 x 0.95 = $\boxed{53}$

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE IS-7

LOCATION Building 21-900

DATE OF OPERATION OR OCCURRENCE 1950's through present

OWNER/OPERATOR Elmendorf AFB

COMMENTS/DESCRIPTION Floor drains discharge to seepage pit north of building

SITE RATED BY W. B. Christingher

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundary	1	6	6	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	1	9	9	27
H. Population served by surface water supply within 3 miles downstream of site	3	6	18	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	108	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 60

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) M
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard rating (H = high, M = medium, L = low) M

Factor Subscore A (from 20 to 100 based on factor score matrix) 60

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

60 x 0.8 = 48

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

48 x 1.0 = 48

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore ______

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	-	8	-	-
Net precipitation	-	6	-	-
Surface erosion	-	8	-	-
Surface permeability	-	6	-	-
Rainfall intensity	-	8	-	-
Subtotals			-	-

Subscore (100 X factor score subtotal/maximum score subtotal) -

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding	0	1	0	1

Subscore (100 x factor score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	2	6	12	18
Soil permeability	3	8	24	24
Subsurface flows	0	8	0	24
Direct access to ground water	2	8	16	24
Subtotals			68	114

Subscore (100 x factor score subtotal/maximum score subtotal) 60

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 60

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	60
Waste Characteristics	48
Pathways	60

Total 168 divided by 3 = 56 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

56 x 0.95 = $\boxed{53}$

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE IS-8

LOCATION Building 32-060

DATE OF OPERATION OR OCCURRENCE 1950's through present

OWNER/OPERATOR Elmendorf AFB

COMMENTS/DESCRIPTION Floor drains discharge to dry wells

SITE RATED BY W. B. Christopher

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundary	1	6	6	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	1	9	9	27
H. Population served by surface water supply within 3 miles downstream of site	3	6	18	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	108	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 60

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) M
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard rating (H = high, M = medium, L = low) M

Factor Subscore A (from 20 to 100 based on factor score matrix) 60

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

60 x 0.8 = 48

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

48 x 1.0 = 48

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore ______

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	-	8	-	-
Net precipitation	-	6	-	-
Surface erosion	-	8	-	-
Surface permeability	-	6	-	-
Rainfall intensity	-	8	-	-
Subtotals			-	-

Subscore (100 X factor score subtotal/maximum score subtotal) -

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
2. Flooding	0	1	0	1

Subscore (100 x factor score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	2	6	12	18
Soil permeability	3	8	24	24
Subsurface flows	0	8	0	24
Direct access to ground water	2	8	16	24
Subtotals			68	114

Subscore (100 x factor score subtotal/maximum score subtotal) 60

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 60

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	60
Waste Characteristics	48
Pathways	60
Total 168 divided by 3 =	56
	Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

56 x 0.95 = $\boxed{53}$

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE IS-2
LOCATION Building 42-425
DATE OF OPERATION OR OCCURRENCE Late 1930's through present
OWNER/OPERATOR Elmendorf AFB
COMMENTS/DESCRIPTION Floor drains discharge to dry wells
SITE RATED BY W. G. Christopher

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	2	4	8	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	2	3	6	9
D. Distance to reservation boundary	1	6	6	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	1	9	9	27
H. Population served by surface water supply within 3 miles downstream of site	3	6	18	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	101	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 56

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) M
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard rating (H = high, M = medium, L = low) M

Factor Subscore A (from 20 to 100 based on factor score matrix) 60

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

60 x 0.8 = 48

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

48 x 1.0 = 48

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore ______

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	-	8	-	-
Net precipitation	-	6	-	-
Surface erosion	-	8	-	-
Surface permeability	-	6	-	-
Rainfall intensity	-	8	-	-
Subtotals			-	-

Subscore (100 X factor score subtotal/maximum score subtotal) -

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
2. Flooding	0	1	0	1

Subscore (100 x factor score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	2	6	16	18
Soil permeability	3	8	24	24
Subsurface flows	0	8	0	24
Direct access to ground water	2	8	16	24
Subtotals			68	114

Subscore (100 x factor score subtotal/maximum score subtotal) 60

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 60

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	56
Waste Characteristics	48
Pathways	60
Total 164 divided by 3 =	55
	Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

55 x 0.95 = $\boxed{52}$

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE D-16 POL Sludge Disposal Site No. 3

LOCATION Northwest of Alaska Railroad, just west of Hubble Road

DATE OF OPERATION OR OCCURRENCE 1970's-1983

OWNER/OPERATOR Elmendorf AFB

COMMENTS/DESCRIPTION POL tank cleanouts

SITE RATED BY W. B. Christopher

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	1	4	4	12
B. Distance to nearest well	0	10	0	30
C. Land use/zoning within 1 mile radius	2	3	6	9
D. Distance to reservation boundary	2	6	12	18
E. Critical environments within 1 mile radius of site	1	10	10	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	1	9	9	27
H. Population served by surface water supply within 3 miles downstream of site	3	6	18	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
Subtotals			83	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 46

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) M
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 80

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

80 x 0.8 = 64

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

64 x 0.75 = 48

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore ______

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	2	8	16	24
Net precipitation	2	6	12	18
Surface erosion	1	8	8	24
Surface permeability	0	6	0	18
Rainfall intensity	3	8	24	24
		Subtotals	60	108

Subscore (100 X factor score subtotal/maximum score subtotal) 56

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding	0	1	0	1

Subscore (100 x factor score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	2	6	12	18
Soil permeability	3	8	24	24
Subsurface flows	0	8	0	24
Direct access to ground water	2	8	16	24
		Subtotals	68	114

Subscore (100 x factor score subtotal/maximum score subtotal) 60

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 60

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	46
Waste Characteristics	48
Pathways	60
Total 154 divided by 3 =	51 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

51 x 1.0 = 51

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE IS-3

LOCATION Building 43-550

DATE OF OPERATION OR OCCURRENCE Late 1950's through present

OWNER/OPERATOR Elmendorf AFB

COMMENTS/DESCRIPTION Floor drains discharge to dry wells

SITE RATED BY W. B. Christogher

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	2	4	8	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	2	3	6	9
D. Distance to reservation boundary	1	6	6	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	1	9	9	27
H. Population served by surface water supply within 3 miles downstream of site	3	6	18	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	101	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 56

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) S
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard rating (H = high, M = medium, L = low) M

Factor Subscore A (from 20 to 100 based on factor score matrix) 50

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

50 x 0.8 = 40

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

40 x 1.0 = 40

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore ______

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	-	8	-	-
Net precipitation	-	6	-	-
Surface erosion	-	8	-	-
Surface permeability	-	6	-	-
Rainfall intensity	-	8	-	-
Subtotals			-	-

Subscore (100 X factor score subtotal/maximum score subtotal) -

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
2. Flooding	0	1	0	1

Subscore (100 x factor score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
~~Net precipitation~~	2	6	12	18
~~Soil permeability~~	3	8	24	24
Subsurface flows	0	8	0	24
Direct access to ground water	2	8	16	24
Subtotals			68	114

Subscore (100 x factor score subtotal/maximum score subtotal) 60

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 60

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	56
Waste Characteristics	40
Pathways	60

Total 156 divided by 3 = 52 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

52 x 0.95 = 49

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE IS-4

LOCATION Building 42-300

DATE OF OPERATION OR OCCURRENCE 1950's through present

OWNER/OPERATOR Elmendorf AFB

COMMENTS/DESCRIPTION Floor drains discharge to dry wells

SITE RATED BY W. G. Christopher

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	2	4	8	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	2	3	6	9
D. Distance to reservation boundary	1	6	6	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	1	9	9	27
H. Population served by surface water supply within 3 miles downstream of site	3	6	18	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	101	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 56

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) S
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard rating (H = high, M = medium, L = low) M

Factor Subscore A (from 20 to 100 based on factor score matrix) 50

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

50 x 0.8 = 40

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

40 x 1.0 = 40

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore ______

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	-	8	-	-
Net precipitation	-	6	-	-
Surface erosion	-	8	-	-
Surface permeability	-	6	-	-
Rainfall intensity	-	8	-	-
		Subtotals	-	-

Subscore (100 X factor score subtotal/maximum score subtotal) -

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
2. Flooding	0	1	0	1

Subscore (100 x factor score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	2	6	16	18
Soil permeability	3	8	24	24
Subsurface flows	0	8	0	24
Direct access to ground water	2	8	16	24
		Subtotals	68	114

Subscore (100 x factor score subtotal/maximum score subtotal) 60

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 60

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	56
Waste Characteristics	40
Pathways	52
Total 156 divided by 3 =	52
	Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

52 x 0.95 = 49

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE IS-5
LOCATION Building 43-410
DATE OF OPERATION OR OCCURRENCE 1950's through present
OWNER/OPERATOR Elmendorf AFB
COMMENTS/DESCRIPTION Floor drains discharge to dry wells
SITE RATED BY W G Christopher

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	2	4	8	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	2	3	6	9
D. Distance to reservation boundary	1	6	6	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	1	9	9	27
H. Population served by surface water supply within 3 miles downstream of site	3	6	18	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	101	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 56

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) S
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard rating (H = high, M = medium, L = low) M

Factor Subscore A (from 20 to 100 based on factor score matrix) 50

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

50 x 0.8 = 40

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

40 x 1.0 = 40

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore ____

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	-	8	-	-
Net precipitation	-	6	-	-
Surface erosion	-	8	-	-
Surface permeability	-	6	-	-
Rainfall intensity	-	8	-	-
Subtotals			-	-

Subscore (100 X factor score subtotal/maximum score subtotal) -

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding	0	1	0	1

Subscore (100 x factor score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	2	6	16	18
Soil permeability	3	8	24	24
Subsurface flows	0	8	0	24
Direct access to ground water	2	8	16	24
Subtotals			68	114

Subscore (100 x factor score subtotal/maximum score subtotal) 60

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 60

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	56
Waste Characteristics	40
Pathways	60

Total 156 divided by 3 = 52 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

52 x .95 = 49

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE IS-6

LOCATION Building 43-450

DATE OF OPERATION OR OCCURRENCE 1950's through present

OWNER/OPERATOR Elmendorf AFB

COMMENTS/DESCRIPTION Floor drains discharge to dry wells

SITE RATED BY W. B. Christopher

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	2	4	8	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	2	3	6	9
D. Distance to reservation boundary	1	6	6	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	1	9	9	27
H. Population served by surface water supply within 3 miles downstream of site	3	6	18	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	101	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 56

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) S
2. Confidence level (C = confirmed, S = suspected) S
3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 40

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

40 x .8 = 32

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

32 x 1.0 = 32

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore ______

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	-	8	-	-
Net precipitation	-	6	-	-
Surface erosion	-	8	-	-
Surface permeability	-	6	-	-
Rainfall intensity	-	8	-	-
Subtotals			-	-

Subscore (100 X factor score subtotal/maximum score subtotal) -

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
2. Flooding	0	1	0	1

Subscore (100 x factor score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	2	6	16	18
Soil permeability	3	8	24	24
Subsurface flows	0	8	0	24
Direct access to ground water	2	8	16	24
Subtotals			68	114

Subscore (100 x factor score subtotal/maximum score subtotal) 60

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 60

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	56
Waste Characteristics	32
Pathways	60

Total 148 divided by 3 = 44 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

44 x .95 = $\boxed{47}$

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE SP-6 Diesel Fuel Spill (Bldg. 2Z013)

LOCATION North of Alaska Railroad, just west of Wilson Drive

DATE OF OPERATION OR OCCURRENCE 31 March 1976

OWNER/OPERATOR Elmendorf AFB

COMMENTS/DESCRIPTION 8,000 gallon diesel fuel spill (SPCC Plan)

SITE RATED BY W. H. Christopher

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	2	10	20	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	1	9	9	27
H. Population served by surface water supply within 3 miles downstream of site	3	6	18	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
Subtotals			110	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 61

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) L
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard rating (H = high, M = medium, L = low) L

Factor Subscore A (from 20 to 100 based on factor score matrix) 50

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

50 x 0.4 = 20

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

20 x 1.0 = 20

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore ______

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	2	8	16	24
Net precipitation	2	6	12	18
Surface erosion	1	8	8	24
Surface permeability	0	6	0	18
Rainfall intensity	3	8	24	24
		Subtotals	60	108

Subscore (100 X factor score subtotal/maximum score subtotal) 56

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding	0	1	0	1

Subscore (100 x factor score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	2	6	12	18
Soil permeability	3	8	24	24
Subsurface flows	1	8	8	24
Direct access to ground water	2	8	16	24
		Subtotals	76	114

Subscore (100 x factor score subtotal/maximum score subtotal) 67

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 67

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	61
Waste Characteristics	20
Pathways	67

Total 148 divided by 3 = 49
Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

49 x .95 = 47

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE SP-1 Diesel Fuel Line Leak

LOCATION

DATE OF OPERATION OR OCCURRENCE 1956-1958

OWNER/OPERATOR Elmendorf AFB

COMMENTS/DESCRIPTION Several thousand gallons of diesel fuel leaked near railroad tracks

SITE RATED BY W. G. Christopher

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	2	10	20	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	1	9	9	27
H. Population served by surface water supply within 3 miles downstream of site	3	6	18	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
Subtotals			110	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 61

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) M
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard rating (H = high, M = medium, L = low) L

Factor Subscore A (from 20 to 100 based on factor score matrix) 40

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

40 x 0.4 = 16

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

16 x 1.0 = 16

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore ______

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	2	8	16	24
Net precipitation	2	6	12	18
Surface erosion	1	8	8	24
Surface permeability	0	6	0	18
Rainfall intensity	3	8	24	24
Subtotals			60	108

Subscore (100 X factor score subtotal/maximum score subtotal) 56

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding	0	1	0	1

Subscore (100 x factor score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	2	6	12	18
Soil permeability	3	8	24	24
Subsurface flows	1	8	8	24
Direct access to ground water	2	8	16	24
Subtotals			76	114

Subscore (100 x factor score subtotal/maximum score subtotal) 67

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 67

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	61
Waste Characteristics	16
Pathways	67

Total 144 divided by 3 = 48 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

48 x .95 = 46

HAZARD ASSESSMENT R. TING METHODOLOGY FORM

NAME OF SITE SP-4 Railroad Maintenance Area Oil Seepage

LOCATION North of Ship Creek, located in abandoned railroad, south of airmen dorms

DATE OF OPERATION OR OCCURRENCE Late 1960's

OWNER/OPERATOR Elmendorf AFB

COMMENTS/DESCRIPTION Brown oil globs seeping into marsh area

SITE RATED BY W. D. Chris'opher

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	2	10	20	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	1	9	9	27
H. Population served by surface water supply within 3 miles downstream of site	3	6	18	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	110	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 61

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) S
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard rating (H = high, M = medium, L = low) M

Factor Subscore A (from 20 to 100 based on factor score matrix) 50

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

50 x 0.4 = 20

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

20 x 1.0 = 20

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore ______

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	3	8	24	24
Net precipitation	2	6	12	18
Surface erosion	1	8	8	24
Surface permeability	0	6	0	18
Rainfall intensity	3	8	24	24
		Subtotals	68	108

Subscore (100 X factor score subtotal/maximum score subtotal) 63

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding	0	1	0	1

Subscore (100 x factor score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	2	6	12	18
Soil permeability	3	8	24	24
Subsurface flows	0	8	0	24
Direct access to ground water	2	8	16	24
		Subtotals	68	114

Subscore (100 x factor score subtotal/maximum score subtotal) 60

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 63

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	61
Waste Characteristics	20
Pathways	63
Total 144 divided by 3 =	48 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

48 x .95 = 46

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE D-13 Disposal Site

LOCATION East of Davis Hwy, south of Marketing & Redistribution Storage

DATE OF OPERATION OR OCCURRENCE 1967-1971

OWNER/OPERATOR Elmendorf AFB

COMMENTS/DESCRIPTION Metal pipes, empty metal drums, quickla trend, gravel pit area

SITE RATED BY W. A. Christopher

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	1	4	4	12
B. Distance to nearest well	1	10	10	30
C. Land use/zoning within 1 mile radius	2	3	6	9
D. Distance to reservation boundary	2	6	12	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	1	9	9	27
H. Population served by surface water supply within 3 miles downstream of site	3	6	18	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
Subtotals			83	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 46

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) M
2. Confidence level (C = confirmed, S = suspected) S
3. Hazard rating (H = high, M = medium, L = low) M

Factor Subscore A (from 20 to 100 based on factor score matrix) 40

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

40 x 0.8 = 32

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

32 x 1.0 = 32

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore ______

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	2	8	16	24
Net precipitation	2	6	12	18
Surface erosion	1	8	8	24
Surface permeability	0	6	0	18
Rainfall intensity	3	8	24	24
		Subtotals	60	108

Subscore (100 X factor score subtotal/maximum score subtotal) 56

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
2. Flooding	0	1	0	1

Subscore (100 x factor score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	2	6	12	18
Soil permeability	3	8	24	24
Subsurface flows	1	8	8	24
Direct access to ground water	2	8	16	24
		Subtotals	76	114

Subscore (100 x factor score subtotal/maximum score subtotal) 67

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 67

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors 46
Waste Characteristics 32
Pathways 67

Total 145 divided by 3 = 48
Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

48 x 0.95 = 46

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE D-4 Bluff Disposal Site

LOCATION East of Knik Arm, north of Chee

DATE OF OPERATION OR OCCURRENCE

OWNER/OPERATOR Elmendorf AFB

COMMENTS/DESCRIPTION

SITE RATED BY W. G. Christopher

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	0	4	0	12
B. Distance to nearest well	1	10	10	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	2	10	20	30
F. Water quality of nearest surface water body	2	6	12	18
G. Ground water use of uppermost aquifer	1	9	9	27
H. Population served by surface water supply within 3 miles downstream of site	3	6	18	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	114	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 63

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) L
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard rating (H = high, M = medium, L = low) L

Factor Subscore A (from 20 to 100 based on factor score matrix) 50

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

50 x 0.4 = 20

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

20 x 1.0 = 20

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore ______

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	2	8	16	24
Net precipitation	2	6	12	18
Surface erosion	1	8	8	24
Surface permeability	0	6	0	18
Rainfall intensity	3	8	24	24
		Subtotals	60	108

Subscore (100 X factor score subtotal/maximum score subtotal) 56

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding	0	1	0	1

Subscore (100 x factor score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	2	6	12	18
Soil permeability	3	8	24	24
Subsurface flows	0	8	0	24
Direct access to ground water	2	8	16	24
		Subtotals	68	114

Subscore (100 x factor score subtotal/maximum score subtotal) 60

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 60

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors 63
Waste Characteristics 20
Pathways 60

Total 143 divided by 3 = 48
Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

48 x .95 = 46

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE SP-13 Diesel Fuel Line Leak

LOCATION North of Hangar 3 and west of Taxiway 3

DATE OF OPERATION OR OCCURRENCE 1968

OWNER/OPERATOR Elmendorf AFB

COMMENTS/DESCRIPTION 700-800 gallons

SITE RATED BY W G Christopher

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	1	10	10	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundary	2	6	12	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	1	9	9	27
H. Population served by surface water supply within 3 miles downstream of site	3	6	18	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
Subtotals			94	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 52

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) S
2. Confidence level (C = confirmed, S = suspected) C
3. Hazard rating (H = high, M = medium, L = low) L

Factor Subscore A (from 20 to 100 based on factor score matrix) 30

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

30 x 0.4 = 12

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

12 x 1.0 = 12

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore ______

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	1	8	8	24
Net precipitation	2	6	12	18
Surface erosion	1	8	8	24
Surface permeability	0	6	0	18
Rainfall intensity	3	8	24	24
		Subtotals	52	108

Subscore (100 X factor score subtotal/maximum score subtotal) 48

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding	0	1	0	1

Subscore (100 x factor score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	2	6	12	18
Soil permeability	3	8	24	24
Subsurface flows	1	8	8	24
Direct access to ground water	2	8	16	24
		Subtotals	76	114

Subscore (100 x factor score subtotal/maximum score subtotal) 67

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 67

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	52
Waste Characteristics	12
Pathways	67

Total 131 divided by 3 = 44
Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

44 x 0.95 = $\boxed{42}$

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE D-3 Landfill

LOCATION West of Hospital Drive, south of Well Road, east of Transformer St., north of sewage meter station

DATE OF OPERATION OR OCCURRENCE 1938-1941

OWNER/OPERATOR Elmendorf AFB

COMMENTS/DESCRIPTION General refuse, garbage, timber

SITE RATED BY W G Chrustazkun

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	1	10	10	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	1	9	9	27
H. Population served by surface water supply within 3 miles downstream of site	3	6	18	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
Subtotals			100	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 56

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) S
2. Confidence level (C = confirmed, S = suspected) S
3. Hazard rating (H = high, M = medium, L = low) L

Factor Subscore A (from 20 to 100 based on factor score matrix) 20

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

20 x 0.4 = 8

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

8 x 0.5 = 4

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore ______

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	1	8	8	24
Net precipitation	2	6	12	18
Surface erosion	1	8	8	24
Surface permeability	0	6	0	18
Rainfall intensity	3	8	24	24
Subtotals			52	108

Subscore (100 X factor score subtotal/maximum score subtotal) 48

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding	0	1	0	1

Subscore (100 x factor score/3) 0

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	2	6	12	18
Soil permeability	3	8	24	24
Subsurface flows	1	8	8	24
Direct access to ground water	2	8	12	24
Subtotals			72	114

Subscore (100 x factor score subtotal/maximum score subtotal) 63

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 63

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	56
Waste Characteristics	4
Pathways	63

Total 123 divided by 3 = 41 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

41 x 0.95 = $\boxed{39}$

APPENDIX I

REFERENCES

APPENDIX I

REFERENCES

Alaska District, U.S. Army Corps of Engineers, 1980. Special Flood Hazard Information (Map): Ship Creek at Elmendorf AFB, Anchorage, AK.

Anchorage District, Bureau of Land Management, 1979. Final Environmental Assessment Record (EAR) on Chugach Electric Association's 230 KV line Proposal, Anchorage, AK.

Anonymous, 1964. The Great Alaska Earthquake, March 27, 1964. Alaska Division of Geological and Geophysical Surveys Miscellaneous Paper No. 1.

Barnwell, W.W., George, R.S., Dearborn, L.L., Weeks, J.B. and Zenone, C., 1971. Water for Anchorage. U.S. Geological Survey Open File Report.

Beikman, Helen M., 1980. Geologic Map of Alaska. Alaska Division of Geological and Geophysical Surveys.

Cederstrom, D.J., Trainer, F.W. and Waller, R.M., 1964. Geology and Ground-Water Resources of the Anchorage Area, Alaska. U.S. Geological Survey Water Supply Paper 1773.

Davis, J.B., Farmer, V.E., Kreider, R.E., Straub, A.E. and Reese, K.M., 1972. The Migration of Petroleum Products in Soil and Ground Water. American Petroleum Institute Publication 4149.

Dearborn, L.L. and Barnwell, W.W., 1975. Hydrology for Land-Use Planning: The Hillside Area, Anchorage, Alaska. U.S. Geological Survey Open-File Report 75-105.

Elmendorf AFB, Spill Prevention, Control and Countermeasures Plan, May 1, 1983.

Elmendorf AFB, TAB A-1, 1976.

Freethey, Geoffrey W., 1976. Preliminary Report on Water Availability in the Lower Ship Creek Basin, Anchorage, Alaska. U.S. Geological Survey Water Resources Investigation; 48-75.

Freethey, G.W. and Scully, D.R., 1980. Water Resources of the Cook Inlet Basin. U.S. Geological Survey Hydrologic Investigations Atalas HA-620.

Meyer, W. and Patrick, L., 1980. Effects of Artificial Recharge Experiments at Ship Creek Allluvial Fan on Water Levels at Spring Acres Subdivision, Anchorage, Alaska. U.S. Geological Survey Open File Report 80-1284.

Nelson, Gordon L., 1982. Vertical Movement of Ground Water Under the Merrill Field Landfill, Anchorage, Alaska. U.S. Geological Survey Open-File Report 82-1016.

Schmoll, H.R. and Dobrovolny E., 1972. Generalized Geologic Map of Anchorage and Vicinity, Alaska. U.S. Geological Survey Miscellaneous Investigations Map I-787-A.

Schmoll, H.R. and Dobrovolny, E., 1973. Construction Materials Map of Anchorage and Vicinity, Alaska. U.S. Geological Survey Miscellaneous Investigations Map I-787-C.

Selkregg, L.L., Buck, E.H., Buffler, R.T., Coté, O.E., Evans, C.D. and Fisk, S.G., 1972. Environmental Atlas of the Greater Anchorage Area, Borough, Alaska. Arctic Environmental Information Center, University of Alaska, Anchorage.

USDA, Soil Conservation Service (SCS), 1979. Metropolitan Anchorage Urban Study Volume 7: Anchorage Area Soil Survey.

Wahrhaftig, Clyde, 1965. Physiographic Divisions of Alaska. U.S. Geological Survey Professional Paper 482.

Weeks, John B., 1970. The Relationship Between Surface Water and Ground Water in Ship Creek Near Anchorage, Alaska. U.S. Geological Survey, Professional Paper 700-B, pages 224-226.

Zenone, C. and Anderson, G.S., 1978. Summary Appraisals of the Nations' Ground-Water Resources--Alaska. U.S. Geological Survey, Professional Paper 813-D.

Zenone, C. and Donaldson, D.E., 1974. Water Quality and Geohydrologic. Data at two sanitary landfill sites near Anchorage, Alaska. U.S. Geological Survey Open-File Reports.

APPENDIX J

GLOSSARY OF TERMINOLOGY AND ABBREVIATIONS

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GLOSSARY OF TERMINOLOGY AND ABBREVIATIONS

AAC: Alaskan Air Command

AF: Air Force

AFB: Air Force Base

AFCS: Air Force Communications Service

AFESC: Air Force Engineering and Services Center

AFFF: Aqueous Film Forming Foam, a fire extinquishing agent

AFR: Air Force Regulation

AFS: Air Force Station

Ag: Chemical symbol for silver

AGS: Aircraft Generation Squadron

Al: Chemical symbol for aluminum

ALLUVIUM: Materials eroded, transported and deposited by streams

ALLUVIAL FAN: A fan-shaped deposit formed by a stream either where it issues from a narrow mountain valley into a plain or broad valley, or where a tributary stream joins a main stream.

ANG: Air National Guard

ARTESIAN: Ground water contained under hydrostatic pressure

AQUIFER: A geologic formation, group of formations, or part of a formation that is capable of yielding water to a well or spring

ASC: Audiovisual Service Center

AVGAS: Aviation Gasoline

Ba: Chemical symbol for barium

BEDROCK, METAMORPHOSED: Lower Cretaceons to upper Jurrassic moderately to strongly metamorphosed flysch, greenstone, schist, gabbro, granodiosite, sepentine (from Beikmen, 1980).

BES: Bioenvironmental Engineering Services

BOWSERS: Portable device used to store liquid waste oils

Cd: Chemical symbol for cadmium

CE: Civil Engineering

CERCLA: Comprehensive Environmental Response, Compensation and Liability Act

CES: Civil Engineering Squadron

CIRCA: About; used to indicate an approximate date

CLOSURE: The completion of a set of rigidly defined functions for a hazardous waste facility no longer in operation

CN: Chemical symbol for cyanide

COE: Corps of Engineers

CONFINED AQUIFER: An aquifer bounded above and below by impermeable strata or by geologic units of distinctly lower permeability than that of the aquifer itself

CONTAMINATION: The degradation of natural water quality to the extent that its usefulness is impaired; there is no implication of any specific limits since the degree of permissible contamination depends upon the intended end use or uses of the water

Cr: Chemical symbol for chromium

CRS: Component Repair Squadron

CSG: Combat Support Group

Cu: Chemical symbol for copper

DET: Detachment

DISPOSAL FACILITY: A facility or part of a facility at which hazardous waste is intentionally placed into or on land or water, and at which waste will remain after closure

DISPOSAL OF HAZARDOUS WASTE: The discharge, deposit, injection, dumping, spilling, or placing of any hazardous waste into or on land or water so that such waste or any constituent thereof may enter the environment or be emitted into the air or discharged into any waters, including ground water

DOD: Department of Defense

DOWNGRADIENT: In the direction of decreasing hydraulic static head; the direction in which ground water flows

DPDO: Defense Property Disposal Office, previously included Redistribution and Marketing (R&M) and Salvage.

DUMP: An uncovered land disposal site where solid and/or liquid wastes are deposited with little or no regard for pollution control or aesthetics; dumps are susceptible to open burning and are exposed to the elements, disease vectors and scavengers

EFFLUENT: A liquid waste discharge from a manufacturing or treatment process, in its natural state, or partially or completely treated, that discharges into the environment

EMS: Equipment Maintenance Squadron

EOD: Explosive Ordnance Disposal

EP: Extraction Procedure, the EPA's standard laboratory procedure for leachate generation

EPA: U.S. Environmental Protection Agency

EROSION: The wearing away of land surface by wind, water, or chemical processes

ESKERS: Elongate ridge of stratified gravel, sand, salt and clay, deposited as a result of glacial meltwater outflow.

FAA: Federal Aviation Administration

FACILITY: Any land and appurtenances thereon and thereto used for the treatment, storage and/or disposal of hazardous wastes

FAULT: A fracture in rock along which the adjacent rock surfaces are differentially displaced

Fe: Chemical symbol for iron

FLOOD PLAIN: The lowland and relatively flat areas adjoining inland and coastal areas of the mainland and off-shore islands, including, at a minimum, areas subject to a one percent or greater chance of flooding in any given year

FLOW PATH: The direction or movement of ground water as governed principally by the hydraulic gradient

FT: Fire Training Area

GALLERY: Drinking water intake system constructed below ground near a stream so as to take in surface water filtered by an alluvial covering.

GLACIAL TILL: Unsorted and unstratified drift consisting of clay, sand, gravel and boulders which is deposited by and underneath a glacier

GLIDE-BLOCK: A large section of a geologic unit that has separated from the main portion of the unit due to earthquake/landslide-induced lateral movement

GROUND WATER: Water beneath the land surface in the saturated zone that is under atmospheric or artesian pressure

GROUND WATER RESERVOIR: The earth materials and the intervening open spaces that contain ground water

HARDFILL: Disposal sites receiving construction debris, wood, miscellaneous spoil material

HARM: Hazard Assessment Rating Methodology

HAZARDOUS WASTE: As defined in RCRA, a solid waste, or combination of solid wastes, which because of its quantity, concentration, or physical, chemical or infectious characteristics may cause or significantly contribute to an increase in mortality or an increase in serious, irreversible, or incapacitating reversible illness; or pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, or disposed of, or otherwise managed

HAZARDOUS WASTE GENERATION: The act or process of producing a hazardous waste

HEAVY METALS: Metallic elements, including the transition series, which include many elements required for plant and animal nutrition in trace concentrations but which become toxic at higher concentrations

Hg: Chemical symbol for mercury

HQ: Headquarters

HWMF: Hazardous Waste Management Facility

INCOMPATIBLE WASTE: A waste unsuitable for commingling with another waste or material because the commingling might result in generation of extreme heat or pressure, explosion or violent reaction, fire, formation of substances which are shock sensitive, friction sensitive, or otherwise have the potential for reacting violently, formation of toxic dusts, mists, fumes, and gases, volatilization of ignitable or toxic chemicals due to heat generation in such a manner that the likelihood of contamination of ground water or escape of the substance into the environment is increased, any other reaction which might result in not meeting the air, human health, and environmental standards

INFILTRATION: The movement of water through the soil surface into the ground

IRP: Installation Restoration Program

ISOPACH: Graphic presentation of geologic data, including lines of equal unit thickness that may be based on confirmed (drill hole) data or indirect geophysical measurement

JP-4: Jet Propulsion Fuel Number Four

LEACHATE: A solution resulting from the separation or dissolving of soluble or particulate constituents from solid waste or other man-placed medium by percolation of water

LEACHING: The process by which soluble materials in the soil, such as nutrients, pesticide chemicals or contaminants, are washed into a lower layer of soil or are dissolved and carried away by water

LENTICULAR: A bed or rock stratum or body that is lens-shaped

LINER: A continous layer of natural or man-made materials beneath or on the sides of a surface impoundment, landfill, or landfill cell which restricts the downward or lateral escape of hazardous waste, hazardous waste constituents or leachate

LOESS: An essentially unconsolidated unstratified calcareous silt; commonly homogeneous, permeable and buff to gray in color

MAC: Military Airlift Command

MATS: Military Air Transport Service

MAW: Military Airlift Wing

MEK: Methyl Ethyl Ketone

MGD: Million Gallons per Day

MOGAS: Motor gasoline

Mn: Chemical symbol for manganese

MONITORING WELL: A well used to measure ground-water levels and to obtain samples

MORAINE: An accumulation of glacial drift deposited cheifly by direct glacial action and possessing initial constructional form independent of the floor beneath it

MSL: Mean Sea Level

NCO: Non-commissioned Officer

NCOIC: Non-commissioned Officer In-Charge

NDI: Non-destructive Inspection

Ni: Chemical symbol for nickel

NORAD: North American Defense Command

NPDES: National Pollutant Discharge Elimination System

OEHL: Occupational and Environmental Health Laboratory

ORGANIC: Being, containing or relating to carbon compounds, especially in which hydrogen is attached to carbon

OSI: Office of Special Investigations

O&G: Symbols for oil and grease

Pb: Chemical symbol for lead

PCB: Polychlorinated Biphenyl; liquids used as a dielectrics in electrical equipment

PERCOLATION: Movement of moisture by gravity or hydrostatic pressure through interstices of unsaturated rock or soil

PERMEABILITY: The capacity of a porous rock, soil or sediment for transmitting a fluid without damage to the structure of the medium

PD-680: Cleaning solvent

pH: Negative logarithm of hydrogen ion concentration

PL: Public Law

POL: Petroleum, Oils and Lubricants

POLLUTANT: Any introduced gas, liquid or solid that makes a resource unfit for a specific purpose

PPB: Parts per billion by weight

PPM: Parts per million by weight

QUATERNARY MATERIALS: The second period of the Cenozoic geologic era, following the Tertiary, and including the last 2-3 million years

RCRA: Resource Conservation and Recovery Act

RECHARGE AREA: A surface area in which surface water or precipitation percolates through the unsaturated zone and eventually reaches the zone of saturation. Recharge areas may be natural or manmade

RECHARGE: The addition of water to the ground-water system by natural or artificial processes

SANITARY LANDFILL: A land disposal site using an engineered method of disposing solid wastes on land in a way that minimizes environmental hazards

SATURATED ZONE: That part of the earth's crust in which all voids are filled with water

SCS: U.S. Department of Agriculture Soil Conservation Service

SLUDGE: Any garbage, refuse, or slude from a waste treatment plant, water supply treatment, or air pollution control facility and other discarded material, including solid, liquid, semi-solid, or contained gaseous material resulting from industrial, commercial, mining, or agricultural operations and from community activities, but does not include solid or dissolved materials in domestic sewage; solid or dissolved materials in irrigation return flows; industrial discharges which are point source subject to permits under Section 402 of the Federal Water Pollution Control Act, as amended (86 USC 880); or source, special nuclear, or by-product material as defined by the Atomic Energy Act of 1954 (68 USC 923)

SPILL: Any unplanned release or discharge of a hazardous waste onto or into the air, land, or water

STORAGE OF HAZARDOUS WASTE: Containment, either on a temporary basis or for a longer period, in such a manner as not to constitute disposal of such hazardous waste

STP: Sewage Treatment Plant

TAC: Tactical Air Command

TDS: Total Dissolved Solid, a water quality parameter

TOXICITY: The ability of a material to produce injury or disease upon exposure, ingestion, inhalation, or assimilation by a living organism

TREATMENT OF HAZARDOUS WASTE: Any method, technique, or process including neutralization designed to change the physical, chemical, or biological character or composition of any hazardous waste so as to neutralize the waste or so as to render the waste nonhazardous

TSD: Treatment, storage or disposal

UPGRADIENT: In the direction of increasing hydraulic static head; the direction opposite to the prevailing flow of ground-water

USAF: United States Air Force

USAFSS: United States Air Force Security Service

USGS: United States Geological Survey

WATER TABLE: Surface of a body of unconfined ground water at which the pressure is equal to that of the atmosphere

Zn: Chemical symbol for zinc

APPENDIX K

INVENTORY OF STORAGE TANKS

TABLE K.1

JP-4 JET FUEL STORAGE CAPACITY

Facilities (Storage Tanks)*	Capacity (per/gal)	Total Capacity (gal)	Subtotals
601-604	1,000,000	4,000,000	
701-729	50,000	1,450,000	
730-733	1,050,000	4,200,000	
734-735	840,000	3,360,000	
36-38	50,000	150,000	
43-50	50,000	400,000	
53	25,000	25,000	
54-59	50,000	300,000	
60	25,000	25,000	
61-66	50,000	300,000	
67	25,000	25,000	
68-95	50,000	1,400,000	
			15,635,000

* See tank inventory.

TABLE K.2

DIESEL FUEL STORAGE CAPACITY

Facilities (Tank No., etc)	Capacity (per/gal)	Total Capacity (gal)	Subtotals
96-100	25,000	125,000	
101-102	50,000	100,000	
103-104	10,000	20,000	
105	105,000	105,000	
122	10,000	10,000	
132	420,000	420,000	
			780,000
Misc Support Tanks			254,000
Misc Issue Tanks			2,600
Other Misc Tanks			10,000
Fuel Pipeline			7,163
		GRAND TOTAL	1,053,763

PROPANE FUEL STORAGE CAPACITY

Facilities	Capacity (per/gal)	Total Capacity (gal)	Subtotals
(Farm 3)	1,000	1,000	

TABLE K.3

AVGAS STORAGE CAPACITY

Facilities (Tank No., etc)	Capacity (per/gal)	Total Capacity (gal)	Subtotals
51	50,000	50,000	
			50,000
Other Misc Tanks			9,700
Pipeline			3,585
		GRAND TOTAL	63,285

MOGAS STORAGE CAPACITY

Facilities (Tank No., etc)	Capacity (per/gal)	Total Capacity (gal)	Subtotals
42	25,000	25,000	
52	50,000	50,000	
124-126	25,000	75,000	
			150,000
Misc Support Tanks			80
Misc Issue Tanks			20,305
Other Misc Tanks			64,000
		GRAND TOTAL	234,385

TABLE K.4

DEICER STORAGE CAPACITY

Facilities (Tank No., etc)	Capacity (per/gal)	Total Capacity (gal)	Subtotals
39-41	50,000	150,000	
133-134	50,000	100,000	
111-120	25,000	250,000	
			500,000
Pipeline			474
		GRAND TOTAL	500,474

ISOPROPYL ALCOHOL STORAGE CAPACITY

Facilities (Tank No., etc)	Capacity (per/gal)	Total Capacity (gal)	Subtotals
109-110	25,000	50,000	
123	25,000	25,000	
127-129	25,000	75,000	
		GRAND TOTAL	150,000

APPENDIX L

INDEX TO AREAS OF INITIAL ENVIRONMENTAL CONCERN AT ELMENDORF AFB

APPENDIX L

INDEX TO AREAS OF INITIAL ENVIRONMENTAL CONCERN AT ELMENDORF AFB

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IS-6	Building 43-450 Floor Drains	pp. 5, 6, 4-13, 4-37, 4-38, 5-2
IS-7	Building 21-400 Floor Drains	pp. 5, 6, 4-13, 4-37, 4-38, 5-2
IS-8	Building 32-060 Floor Drains	pp. 5, 6, 4-13, 4-37, 4-38, 5-2,